

WEST Search History

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<input type="checkbox"/>	L15	hard\$ and L13	35
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<input type="checkbox"/>	L8	L7 same noaqueous	0
<input type="checkbox"/>	L7	after ion implant\$	2601
<input type="checkbox"/>	L6	l5 and 134/\$.ccls. and (ketone or alcohol or ether or ester)	120
<input type="checkbox"/>	L5	ion implant\$	42692
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<input type="checkbox"/>	L2	L1 and (ketone or alcohol or ether or ester)	2
<input type="checkbox"/>	L1	(6107135 or 5201960 or 5895272 or 6312996).pn.	4

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L2: Entry 2 of 2

File: USPT

Apr 13, 1993

DOCUMENT-IDENTIFIER: US 5201960 A

TITLE: Method for removing photoresist and other adherent materials from substrates

Detailed Description Text (9):

Such vapor condensation and optionally revaporization will cause significant breakdown and fragmentation of the adherent matrix layer. In many cases, the breakdown will be sufficiently complete so that the resulting fragments can be removed by blowing with a clean, inert gas, such as nitrogen, or by washing with distilled water. In the case of highly refractory matrix layers, however, it may be necessary to remove the fragments by washing or spraying with a suitable solvent, such as an alcohol, ketone, ether, ester, or the like.

Detailed Description Text (10):

In the case of highly refractory adherent matrix layers, it may also be desirable to treat the matrix with a pre-swelling solvent prior to penetration and condensation of the condensable solvent. Suitable pre-swelling solvents include dimethyl sulfoxide (DMSO), dimethyl formamide (DMF), N-methyl-2-pyrrolidone, (NMP), tetrahydrofuran (THF), methyl isobutylketone, (MIBK), isopropyl alcohol (IPA), acetone, and the like. The purpose of the pre-swelling solvent is to provide an initial penetration and swelling of the matrix layer to enhance subsequent penetration with the condensable solvent.

Detailed Description Text (24):

A second photoresist layer was applied to a semiconductor wafer, as described above. Instead of hard baking the layer, however, the photoresist was cross-linked by a large dose of ion bombardment. The photoresist layer was previously patterned to produce features in the range from 5 to 100 .mu.m by 100 .mu.m. The photoresist was found to be insoluble in certain strong solvents for the non-cross-linked materials, such as DMSO, NMP, and DMF. Moreover, treatment of the wafers in ammonia as described above for the hard baked photoresist samples, yielded only minor fragmentation of the photoresist, particularly in the peripheral area of the larger features. The photoresist was not removed by subsequent rinses in either water or isopropyl alcohol.

Detailed Description Text (25):

It was found, however, that pretreatment with DMSO vapor at 35.degree. C., followed by exposure to ammonia as described above for the hard baked photoresist samples, resulted in substantially complete disintegration of the photoresist features. Such combined treatment allowed removal of the photoresist with isopropyl alcohol applied as a liquid sprayed under pressure from the overhead spray nozzle.

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L2: Entry 1 of 2

File: USPT

Apr 20, 1999

DOCUMENT-IDENTIFIER: US 5895272 A

**** See image for Certificate of Correction ****

TITLE: Ion-implanted resist removal method

Detailed Description Text (17):

Many different types of conventional resist removal processes are known to those skilled in the art. For example, there are wet chemical etching processes and dry plasma etching processes. Typically, the wet etching processes, utilize solvents such as, for example, hydrogen peroxide-sulfuric acid and those based on phenyl-methyl ethyl ketone and trichloroethylene.

Detailed Description Text (19):

The class of wet etching solvents based on phenyl-methyl ethyl ketone and trichloroethylene is typically used on substrates having aluminum metalization layers since the resist development and the removal system does not chemically attack aluminum.

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L2: Entry 1 of 2

File: USPT

Apr 20, 1999

DOCUMENT-IDENTIFIER: US 5895272 A

**** See image for Certificate of Correction ****

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L16: Entry 1 of 8

File: USPT

Apr 16, 2002

DOCUMENT-IDENTIFIER: US 6372050 B2

TITLE: Non-corrosive stripping and cleaning composition

Brief Summary Text (16):

European Patent Application No. 647884 assigned to J. T. Baker Inc. discloses nonaqueous photoresist stripper composition comprising (i) a stripping solvent (e.g. N-methyl-2-pyrrolidinone), (ii) a nucleophilic amine (e.g., monoethanolamine), and (iii) a reducing agent such as salicyl aldoxime, gallic acid, and gallic acid esters.

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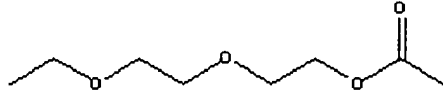


Enter a Chemical Name, CAS Number, Molecular Formula or Weight.

Use * for partial names (e.g. ben*).

Search here for free. For professional searching, use [ChemINDEX](#).**Carbitol Acetate [112-15-2]**

Synonyms: 2-(2-Ethoxyethoxy)ethyl acetate; 3,6-Dioxaoctyl acetate; Diethylene Glycol Monoethyl Ether Acetate; Carbitol Acetate; Ethanol, 2-(2-ethoxyethoxy)-, acetate; Ethyldiglycolacetate;

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Formula	C ₈ H ₁₆ O ₄	Molecular Weight	176.212
CAS RN	112-15-2	Melting Point (°C)	-25
ACX Number	X1002844-1	Boiling Point (°C)	210 - 220
Density	1.01	Vapor Density	
Refractive Index		Vapor Pressure	
Evaporation Rate		Water Solubility	
Flash Point (°C)	100	EPA Code	
DOT Number		RTECS	KK8925000
Comments			

More information about the chemical is available in these categories:

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Trading (1)

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Use * for partial names (e.g. ben*).

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CambridgeSoft Corporation, 100 CambridgePark Drive, Cambridge, MA 02140 USA

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L12: Entry 5 of 21

File: USPT

Mar 30, 2004

DOCUMENT-IDENTIFIER: US 6713232 B2

TITLE: Method of manufacturing semiconductor device with improved removal of resist residues

Detailed Description Text (8):

In connection with the first embodiment and a second embodiment, which will be described later, examples of an organic acid or a salt thereof include carboxylic acid, peroxy acid, carbonate, thiocarboxylic acid, mercaptan, sulfonic acid, sulfinic acid, sulfenic acid, sulphate, phosphoric acid, phosphatidic acid, phosphoric ester, phosphine, and a complex compound of ester of boric acid.

Detailed Description Text (72):

In connection with future devices having improved characteristics, a shallow and high-density impurity implantation profile is desired for a source, a drain and a channel. A resist mask used for changing elements to be implanted according to the polarity of a transistor is degraded by high-density implantation. As a result, removal of a resist mask becomes more difficult. Further, in the process of forming a metal gate described in connection with the fourth embodiment, W, WN, Ti, or TiN; poly-Si; SiN; and SiO₂ are exposed. Therefore, the substrate cannot be subjected to an RCA cleaning operation or an excessive HF-based chemical processing operation. As in the case of the removal of resist residues after etching of a gate, a desire exists for developing a process of removing resist through use of an organic stripper after ion implantation.

Detailed Description Text (75):

In order to solve the problems, the present invention uses a stripper which contains an organic acid or a salt thereof and water and which has a pH below 8. The chemical according to the present invention has an advantage of ability to dissolve resist, thus yielding ability to remove resist after ion implantation. The chemical can be used as one which does not impart damage to a metal gate, which would otherwise be caused by etching.

Detailed Description Text (79):

As shown in Table 1, test examples of chemicals were prepared in different compositions of (a) acetic acid, oxalic acid, malonic acid and tartaric acid, (b) water, (c) dimethylformamide, N-methyl-2-pyrrolidone, dimethylsulfoxide and diethylene glycol monobutyl ether, and (d) vinyltrimethoxysilane, hexamethyldisilazane and aminopropyltrimethoxysilane. Comparative examples of chemicals were also prepared as shown in Table 2.

Detailed Description Text (80):

In the test, the chemicals provided in Tables 1 and 2 were preheated to a temperature of 50.degree. C. Borderless wiring boards manufactured in the manner as shown in FIG. 1 in connection with the first embodiment were immersed in the chemicals. After having been immersed in the chemicals for 15 min., the borderless wiring boards were rinsed with isopropyl alcohol and subsequently rinsed with purified water. After having been dried, the borderless wiring boards were observed under a scanning electron microscope (SEM) at about 30,000 magnifications, thereby evaluating removal of resist residues, thinning of an aluminum interconnection, and disappearance/presence of a W plug according to a method which will be described

below. Evaluation results appear in evaluation columns of Tables 1 and 2.

Detailed Description Text (98):

According to still another aspect of the present invention, resist or resist residues are removed through use of a stripper which contains an organic acid or salt thereof and water and which has a pH below 8, in a process in which a metal material such as W, WN, Ti, or TiN; poly-Si; SiN; and SiO.sub.2 are exposed on the surface of a wafer after etching of a metal gate, or in a process after ion implantation which is performed after etching of a metal gate.

Detailed Description Paragraph Table (1):

TABLE 1 Examples 1 2 3 4 5 6 7 8 Composition of Chemical (wt. %) (a) Acetic Acid 10 Oxalic Acid 3 3 3 3 Malonic Acid 10 10 Tartaric Acid 60 (b) Water 50 70 40 69.9 40 35 69.9 69.9 (c) Dimethylformamide 40 N-methyl-2-pyrrolidone 50 49.95 Dimethylsulfoxide Diethylene Glycol Monobutyl Ether 27 27 4.9 27 27 (d) Vinyltrimethoxysilane 0.1 0.05 0.1 Hexamethyldisilazane 0.1 Aminopropyltrimethoxysilane 0.1 pH of Chemical 2.5 1.4 1.5 1.4 1.5 0.2 1.4 1.4 Evaluation Removal of Resist Residues good good good good good good good good Thinning of Al interconnection A C A B A B B A Disappearance/preservation of W plug P P P P P P P P Thinning of Al interconnection A: less than 3 nm B: less than 10 nm C: 10 nm to 20 nm Disappearance/preservation of W plug D: Disappeared - W plug has disappeared P: Preserved - W plug remains

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L6: Entry 49 of 120

File: USPT

Oct 8, 2002

DOCUMENT-IDENTIFIER: US 6461971 B1

**** See image for Certificate of Correction ****

TITLE: Method of residual resist removal after etching of aluminum alloy films in chlorine containing plasma

Brief Summary Text (14):

U.S. Pat. No. 5,350,484 to Gardner et al. describes a method for anisotropically etching metal interconnects especially in the fabrication of ULSI, high aspect ratio interconnects. Ions are implanted into a region of the metal film to be etched, to form a converted layer of metal compounds in the region. The converted layer is then selectively etched and removed at low temperatures with an etchant (HCl, NH₄OH, MeOH, ether, alcohol, acetone and water for a copper metal film) chosen to decrease etching of the metal film. Gardner et al. deals with wet processes which are not taken into account.

Current US Cross Reference Classification (1):

134/1.2

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L6: Entry 56 of 120

File: USPT

Apr 30, 2002

DOCUMENT-IDENTIFIER: US 6379875 B2

TITLE: Stripper pretreatment

Brief Summary Text (5):

Numerous polymer stripper compositions have been developed to remove positive and negative photoresists. For example, U.S. Pat. No. 5,962,197 (Chen) discloses a composition for removing photoresists or soldermasks containing 30-80% by weight of a propylene glycol ether, 10-60% by weight of a pyrrolidone, 0.1-5% by weight of potassium hydroxide, 0.1-10% by weight of a surfactant, 0-20% by weight of 1,3-butanediol 0-10% by weight of 2-(2-aminoethoxy)ethanol, and a water content of <1%. Other compositions are known that contain amines, such as alkanolamines, or tetraalkylammonium hydroxides, such as tetramethylammonium hydroxide, as the active polymer removing agent. Surfactants may optionally be used in such compositions. See, for example, PCT patent application WO 88/105813 (Martin et al.) which discloses a mixture having a selected solvent as the major component and a tetraalkylammonium hydroxide as a minor component and optionally a surfactant.

Brief Summary Text (8):

Methods for increasing the effectiveness of polymer removers have been proposed. For example, U.S. Pat. No. 4,786,578 (Neisius et al.) discloses a rinse solution used after a photoresist stripper. This rinse solution contains a nonionic surfactant and an organic base, such as an alkanolamine, that will form a water-soluble salt with alkylbenzenesulfonic acids. U.S. Pat. No. 4,824,762 (Kobayashi et al.) discloses a photoresist stripper post rinse containing a glycol ether and an aliphatic amine. In both patents, the compositions contain amines which tend to cause corrosion of copper present in the electronic devices. A pretreatment has been proposed using hot (110-125.degree. C.) solvent, see U.S. Pat. No. 4,202,703 (Zuber et al.). In this patent, the pretreatment was followed by a stripper containing a tetraalkylammonium hydroxide and then a post rinse with 1,1,1-trichloroethane. Such a process raises a number of environmental concerns.

Brief Summary Text (12):

In one aspect, the present invention provides a composition for the pretreatment of polymeric material to be removed from a substrate including one or more polyol compounds, one or more glycol ethers, water and one or more surfactants, wherein the composition is substantially free of amines, alkanolamines, hydroxylamines, tetraalkylammonium hydroxides, ammonium bifluoride, ammonium-tetramethylammonium bifluoride, and alkali metal hydroxides.

Brief Summary Text (14):

In a third aspect, the present invention provides a method for preparing integrated circuits including one or more polymeric materials to be removed including the steps of: a) contacting the polymeric material with a pretreatment composition including one or more one or more polyol compounds, one or more glycol ethers, water and one or more surfactants for a period of time sufficient to pretreat the polymeric material; b) removing the polymeric material from contact with the pretreatment composition; and c) then contacting the polymeric material with a polymer stripping composition; wherein the pretreatment composition is substantially free of amines, alkanolamines, hydroxylamines, tetraalkylammonium hydroxides, ammonium bifluoride, ammonium-tetramethylammonium bifluoride, and

alkali metal hydroxides.

Brief Summary Text (15):

In a fourth aspect, the present invention provides a method for preparing magnetic thin film heads including the steps of: a) contacting a magnetic thin film head precursor containing a polymeric material to be removed with a pretreatment composition including one or more polyol compounds, one or more glycol ethers, water and one or more surfactants for a period of time sufficient to pretreat the polymeric material; b) removing the polymeric material from contact with the pretreatment composition; and c) then contacting the polymeric material with a polymer stripping composition, wherein the pretreatment composition is substantially free of amines, alkanolamines, hydroxylamines, tetraalkylammonium hydroxides, ammonium bifluoride, ammonium-tetramethylammonium bifluoride, and alkali metal hydroxides.

Brief Summary Text (17):

As used throughout this specification, the following abbreviations shall have the following meanings unless the context clearly indicates otherwise: .degree. C.=degrees Centigrade; % wt=percent by weight; mL=milliliter; min=minute; DPM=dipropylene glycol monomethyl ether; DPNB=dipropylene glycol mono-n-butyl ether; and MP-diol=2-methyl-1,3-propanediol. All percentages are by weight. All numerical ranges are inclusive and combinable.

Brief Summary Text (18):

The terms "stripping" and "removing" are used interchangeably throughout this specification. Likewise, the terms "stripper" and "remover" are used interchangeably. "Alkyl" refers to linear, branched and cyclic alkyl. The term "substituted alkyl" refers to an alkyl group having one or more of its hydrogens replaced with another substituent group, such as halogen, cyano, nitro, (C.sub.1 - C.sub.6)alkoxy, mercapto, (C.sub.1 - C.sub.6)alkylthio, and the like. As used throughout this specification, the term "aprotic" refers to compounds that do not accept or yield a proton. The term "glycol" refers to dihydric alcohols. Thus, the term "glycol ether" refers to ethers of dihydric alcohols.

Brief Summary Text (20):

The compositions useful for pretreating polymeric material according to the present invention include one or more polyol compounds, one or more glycol ethers, water and one or more surfactants. Such pretreatment compositions are typically substantially free of polymer removing components, such as amines, alkanolamines, hydroxylamines, tetraalkylammonium hydroxides, ammonium bifluoride, ammonium-tetramethylammonium bifluoride, alkali metal hydroxides and the like. It is preferred that the pretreatment compositions of the present invention are free of amines, alkanolamines, hydroxylamines, tetraalkylammonium hydroxides, ammonium bifluoride, ammonium-tetramethylammonium bifluoride and alkali metal hydroxides.

Brief Summary Text (22):

The glycol ethers useful in the present invention are any which are water miscible, compatible with the polyol compound and do not destabilize the composition such as glycol mono(C.sub.1 - C.sub.6)alkyl ethers and glycol di(C.sub.1 - C.sub.6)alkyl ethers, such as but not limited to (C.sub.1 - C.sub.20)alkanediol (C.sub.1 - C.sub.6)alkyl ethers and (C.sub.1 - C.sub.20)alkanediol di(C.sub.1 - C.sub.6)alkyl ethers. Suitable glycol ethers include, but are not limited to, ethylene glycol monomethyl ether, diethylene glycol monomethyl ether, propylene glycol monomethyl ether, propylene glycol dimethyl ether, propylene glycol mono-n-butyl ether, dipropylene glycol monomethyl ether, dipropylene glycol dimethyl ether, dipropylene glycol mono-n-butyl ether, tripropylene glycol monomethyl ether, and the like. It is preferred that the glycol ether is dipropylene glycol monomethyl ether, tripropylene glycol monomethyl ether, propylene glycol mono-n-butyl ether or dipropylene glycol mono-n-butyl ether. Such glycol ethers are generally commercially available and may be used without further purification. Typically, the

glycol ethers are present in the compositions of the invention in an amount in the range of from about 0.5 to about 20% wt based on the total weight of the composition, and preferably from about 5 to about 10% wt.

Brief Summary Text (23):

Nonionic, anionic, cationic and amphoteric surfactants may be used in the compositions of the present invention. Nonionic surfactants are preferred. Such surfactants are generally commercially available. Useful nonionic surfactants include, but are not limited to, ethoxylated alkylphenols, fatty acid ethoxylates, fatty alcohol ethoxylates, ethylene oxide/propylene oxide ("EO/PO") condensates, and the like. Suitable ethoxylated alkylphenols include ethoxylation products of (C.sub.6 -C.sub.14)alkylphenols, that is alkylphenols having 6 to 14 carbon atoms in the alkyl chain, and a degree of ethoxylation of 2 to 20. Fatty acids or fatty alcohol ethoxylates with saturated or unsaturated hydrocarbon chains having 8 to 24 carbon atoms and a degree of ethoxylation of 2 to 20 are also suitable. Particularly suitable EO/PO condensates are those having about 10 to about 20 EO or PO units.

Brief Summary Text (27):

Any corrosion inhibitor which reduces the corrosion of metal film layers is suitable for use in the present invention. Suitable corrosion inhibitors include, but are not limited to, catechol; (C.sub.1 -C.sub.6)alkylcatechol such as methylcatechol, ethylcatechol and tert-butylcatechol; benzotriazole; hydroxyanisole; (C.sub.1 -C.sub.10)alkylbenzotriazoles; (C.sub.1 -C.sub.10)hydroxyalkylbenzotriazoles; 2-mercaptobenimidazole; gallic acid; gallic acid esters such as methyl gallate and propyl gallate; and the like. It is preferred that the corrosion inhibitor is catechol, (C.sub.1 -C.sub.6)alkylcatechol, benzotriazole or (C.sub.1 -C.sub.10)alkylbenzotriazoles, 2-mercaptobenimidazole, and more preferably benzotriazole and tert-butylcatechol. Such corrosion inhibitors are generally commercially available from a variety of sources, such as Aldrich (Milwaukee, Wis.) and may be used without further purification.

Brief Summary Text (30):

The compositions of the present invention may be prepared by combining the one or more polyol compounds, one or more glycol ethers, water, one or more surfactants and optionally one or more additives in any order.

Brief Summary Text (31):

The compositions of the present invention are suitable for pretreating polymeric material to be removed from a substrate. The removal of any polymeric material, such as, but not limited to, photoresists, soldermasks, antireflective coatings, and the like, including such polymeric material that has been subjected to harsh process conditions such as plasma etching, auto-plasma ashing, ion implantation or ion milling processes, can be effectively enhanced by first contacting it with the pretreatment compositions of the present invention and then contacting it with known polymer stripping compositions. Any polymeric material subjected to the harsh treatment processes described above is referred to as "post-plasma etch polymeric residue" throughout this specification. The compositions and methods of the present invention are particularly useful in aiding removal of the organometallic polymeric residue present after a dry plasma etching, reactive ion etching and ion milling of materials, such as photoresists, conducting metal layers and insulating dielectric layers.

Brief Summary Text (34):

Following contact with the compositions of the present invention, the substrate is then contacted with known polymer stripping compositions. The substrate may be contacted with the polymer stripping compositions by any known manner, such as immersion of the substrate in a bath, such as a wet chemical bench, containing the polymer stripping composition or by spraying a polymer stripping composition on the surface of the substrate. Any polymer stripping compositions may be advantageously

used with the pretreatment compositions of the present invention. It is preferred that the polymer stripping compositions include one or more of one or more polyol compounds, one or more glycol ethers and water. The polymer stripping compositions typically contain one or more polymer removing components, such as but not limited to amines, alkanolamines, hydroxylamines, tetraalkylammonium hydroxides, ammonium bifluoride, ammonium-tetramethylammonium bifluoride, and the like. It is further preferred that the polymer removing agent is one or more of hydroxylamines, tetraalkylammonium hydroxides, ammonium bifluoride, and ammonium-tetramethylammonium bifluoride. Such polymer stripping compositions are generally well known and commercially available. Suitable polymer stripping compositions include those sold under the tradenames ACT-935 (available from Ashland), EKC-265 (available from EKC Technology, Hayward, Calif.), PRX-407 and PRX-120 (both available from Shipley Company, Silicon Valley Chemlabs, Sunnyvale, Calif.).

Current US Cross Reference Classification (1):

134/26

Current US Cross Reference Classification (2):

134/29

CLAIMS:

1. A method for preparing integrated circuits comprising one or more polymeric materials to be removed comprising the steps of;

a) contacting the polymeric material with a pretreatment composition comprising one or more one or more polyol compounds, one or more glycol ethers, water and one or more surfactants for a period of time sufficient to pretreat the polymeric material;

b) removing the polymeric material from contact with the pretreatment composition; and

c) then contacting the polymeric material with a polymer stripping composition;

wherein the pretreatment composition is substantially free of amines, alkanolamines, hydroxylamines, tetraalkylammonium hydroxides, ammonium bifluoride, ammonium-tetramethylammonium bifluoride, and alkali metal hydroxides.

4. The method of claim 1 wherein the glycol ether is selected from (C.sub.1 - C.sub.20)alkanediol (C.sub.1 -C.sub.6)alkyl ethers or (C.sub.1 -C.sub.20)alkanediol di(C.sub.1 -C.sub.6)alkyl ethers.

5. The method of claim 1 wherein the glycol ether is selected from ethylene glycol monomethyl ether, diethylene glycol monomethyl ether, propylene glycol monomethyl ether, propylene glycol dimethyl ether, propylene glycol mono-n-butyl ether, dipropylene glycol monomethyl ether, dipropylene glycol dimethyl ether, dipropylene glycol mono-n-butyl ether or tripropylene glycol monomethyl ether.

7. The method of claim 6 wherein the nonionic surfactant is selected from ethoxylated alkylphenols, fatty acid ethoxylates, fatty alcohol ethoxylates, or ethylene oxide/propylene oxide ("EO/PO") condensates.

8. A method for preparing magnetic thin film heads comprising the steps of:

a) contacting a magnetic thin film head precursor containing a polymeric material to be removed with a pretreatment composition comprising one or more polyol compounds, one or more glycol ethers, water and one or more surfactants for a period of time sufficient to pretreat the polymeric material;

b) removing the polymeric material from contact with the pretreatment composition;
and

c) then contacting the polymeric material with a polymer stripping composition;

wherein the pretreatment composition is substantially free of amines, alkanolamines, hydroxylamines, tetraalkylammonium hydroxides, ammonium bifluoride, ammonium-tetramethylammonium bifluoride, and alkali metal hydroxides.

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L6: Entry 52 of 120

File: USPT

Jul 23, 2002

US-PAT-NO: 6423480

DOCUMENT-IDENTIFIER: US 6423480 B2

TITLE: Remover composition

DATE-ISSUED: July 23, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ichiki; Naoki	Tsukuba			JP

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Sumitomo Chemical Company, Limited	Osaka			JP	03

APPL-NO: 09/ 742085 [\[PALM\]](#)

DATE FILED: December 22, 2000

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	11-370694	December 27, 1999

INT-CL: [07] [G03 F 7/42](#), [C11 D 17/08](#), [C03 C 23/00](#), [C03 G 1/00](#)

US-CL-ISSUED: 430/329; 430/331, 510/176, 510/175, 548/317.5, 134/2

US-CL-CURRENT: [430/329](#); [134/2](#), [430/331](#), [510/175](#), [510/176](#), [548/317.5](#)

FIELD-OF-SEARCH: 430/331, 430/329, 510/176, 510/175, 548/317.5, 134/2

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected

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PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<input type="checkbox"/> 3112156	November 1963	Vail et al.	548/317.5
<input type="checkbox"/> 3260565	July 1966	Beachem	548/317.5
<input type="checkbox"/> 3903033	September 1975	Chao	548/317.5
<input type="checkbox"/> 4332586	June 1982	North	548/317.5
<input type="checkbox"/> 4650877	March 1987	Mabire et al.	548/317.5

<input type="checkbox"/> 4770668	September 1988	Skoultchi et al.	548/317.5
<input type="checkbox"/> 4997748	March 1991	Takeda et al.	430/331
<input type="checkbox"/> 5110944	May 1992	Yamada et al.	548/317.5
<input type="checkbox"/> 5507978	April 1996	Honda	430/331
<input type="checkbox"/> 5795702	August 1998	Tanabe et al.	430/331
<input type="checkbox"/> 6103898	August 2000	Kramer et al.	548/317.5
<input type="checkbox"/> 6140027	October 2000	Baik et al.	510/176
<input type="checkbox"/> 6238849	May 2001	Marsella et al.	430/331

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
59-49539	March 1984	JP	
64-42653	February 1989	JP	
2-131239	May 1990	JP	
4-350660	December 1992	JP	
6-12455	February 1994	JP	
8-334905	December 1996	JP	

ART-UNIT: 1752

PRIMARY-EXAMINER: Schilling, Richard L.

ATTY-AGENT-FIRM: Birch, Stewart, Kolasch & Birch, LLP

ABSTRACT:

A remover composition obtained by adding 1 to 90% by weight of a cyclic urea compound represented by the following general formula (I): ##STR1##

wherein, each of R.sub.1 and R.sub.2 independently represents a hydrogen atom, hydroxyl group, carboxyl group or alkyl group which may be substituted, and Z represents an oxygen atom or sulfur atom.

12 Claims, 0 Drawing figures

Exemplary Claim Number: 1

BRIEF SUMMARY:

1 BACKGROUND OF THE INVENTION

2 1. Field of the Invention

3 The present invention relates to a remover composition. More particularly, the present invention relates to a remover composition used for removing photoresists and residues in a process of producing a semiconductor element.

4 2. Description of the Related Art

- 5 Recently, formation of finer patterns having high precision is required with development of integrated circuits having higher density, consequently, a dry etching method using a halogen-based gas is frequently used as an etching method instead of a conventional chemical etching method, and further, treatments such as ashing by oxygen plasma, ion implantation and the like are conducted.
- 6 By such a dry etching method, ashing treatment and the like, a photoresist film is oxidized by a halogen-based etching gas, oxygen or the like, as a result, the photoresist film having organic film like property is converted to that having inorganic film like property, further, by an ion implantation treatment, the film gets poor solubility.
- 7 A remover composition is used to remove photoresists and residues after dry etching remaining on the surface parts of wiring layers and insulation film layers, side wall parts of wiring layers and bottom parts of via hole produced in forming wiring layers of a conductive metal and via hole.
- 8 Conventionally, there are used, as a remover composition, mixed solutions of organic alkalis, inorganic alkalis, organic acids, inorganic acids, and polar organic solvents, or aqueous solutions thereof, and for example, JP-A No. 59-49539 discloses a remover composed of a 2-pyrrolidinone compound and a dialkylsulfone compound, JP-A No. 4-350660 discloses a remover composed of 1,3-dimethyl-2-imidazolidinone and dimethylsulfoxide, and JP-B No. 6-12455 discloses a remover composed of an alkanolamine with a sulfonic compound and glycol monoalkyl ether, and the like.
- 9 Further, with development of semiconductor elements having finer structures, corrosion of a metal film used in a wiring layer is also a problem in a process for removing resists and a process for removing residues after dry etching. When a metal film used in a wiring layer is corroded, resistance increases, and problems occur such as increase in power consumption, heat generation from a semiconductor element, and the like.
- 10 However, the conventional remover composition as described above has problems that an ability thereof to remove resists and residues after dry etching is still insufficient, a metal film used in a wiring layer is corroded, and the like.
- 11 Therefore, a remover composition which has further higher removing ability and in which corrosion of a metal film used in a wiring layer does not occur easily is desired.

12 SUMMARY OF THE INVENTION

- 13 An object of the present invention is to provide a remover composition which causes extremely low corrosion of materials such as an insulation film, metal film and the like constituting a semiconductor element in a process of producing the semiconductor element, and has a high ability to remove residues and photoresists formed in producing the semiconductor element by solving the above-mentioned problems.
- 14 The present inventors have intensively studied a removing composition having no above-described problems, and resultantly, found that a removing

composition obtained by adding a cyclic urea compound having a specific structure has extremely low corrosive effect on materials such as an insulation film, metal film and the like and has a high ability to remove residues and photoresists formed in producing a semiconductor element, and have completed the present invention.

- 15 Namely, the present invention relates to [1] a remover composition obtained by adding 1 to 90% by weight of a cyclic urea compound represented by the following general formula (I): ##STR2##
- 16 wherein, each of R.sub.1 and R.sub.2 independently represents a hydrogen atom, hydroxyl group, carboxyl group or alkyl group which may be substituted, and Z represents an oxygen atom or sulfur atom.
- 17 Also, the present invention relates to [2] a remover composition containing 1 to 90% by weight of a cyclic urea compound represented by the general formula (I).
- 18 Further, the present invention relates to [3] a process for removing a photoresist by using the above-mentioned remover composition [1], and [4] a process for removing a residue formed in producing a semiconductor by using the above-mentioned remover composition [1].
- 19 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS
- 20 The present invention will be illustrated in detail below.
- 21 The remover composition of the present invention is obtained by adding 1 to 90% by weight of a cyclic urea compound of the general formula (I), or contains 1 to 90% by weight of a cyclic urea compound represented by the general formula (I). The additional amount or content of the cyclic urea compound is preferably from 10 to 40% by weight.
- 22 Specifically, the remover composition of the present invention is obtained by adding the above-mentioned cyclic urea compound to water and/or organic solvent, or comprises the above-mentioned cyclic urea compound in water and/or organic solvent.
- 23 Namely, the remover composition of the present invention is obtained by adding a cyclic urea compound of the general formula (I) to water and/or water-soluble organic solvent in an amount of 1 to 90% by weight, or contains a cyclic urea compound of the general formula (I) in water and/or water-soluble organic solvent in an amount of 1 to 90% by weight. The additional amount or content of the cyclic urea compound is preferably from 10 to 60% by weight, particularly preferably from 10 to 40% by weight.
- 24 When the concentration is less than 1% by weight, removing property on a photoresist and etching residue is insufficient. While, when over 90% by weight, removing property on an etching residue is insufficient.
- 25 In a cyclic urea compound of the general formula (I) in the present invention, each of R.sub.1 and R.sub.2 independently represents a hydrogen atom, hydroxyl group, carboxyl group or alkyl group which may be substituted. Z represent an oxygen atom (O) or sulfur atom (S).
- 26 When R.sub.1 and R.sub.2 are an alkyl group which may be substituted, groups represented by the following general formula (II):

--(CH.sub.2).sub.n --X (II)

- 27 wherein, n represents an integer of 1 or more. X represents hydrogen, hydroxyl group, methoxy group or ethoxy group, are listed, independently, for R.sub.1 and R.sub.2.
- 28 Preferable R.sub.1 and R.sub.2 represent a hydrogen atom or an alkyl group which may be substituted of the general formula (II), and n represents preferably from 1 to 4, particularly preferably from 1 to 2, from the standpoint of a sufficient ability on removing property of a photoresist and etching residue. Further, it is preferable that R.sub.1.dbd.R.sub.2.
- 29 Examples of an cyclic urea compound of the general formula (I) include 4,5-dihydroxy-2-imidazolidinone, 4,5-dihydroxy-1,3-dimethyl-2-imidazolidinone, 4,5-dihydroxy-1,3-bis(hydroxymethyl)-2-imidazolidinone, 4,5-dihydroxy-1,3-bis(methoxymethyl)-2-imidazolidinone and the like.
- 30 Examples of an organic solvent in the present invention include alcohols such as methanol, ethanol, n-propyl alcohol, isopropyl alcohol, n-butanol, n-butyl alcohol, pentanol, ethylene glycol, glycerin and the like; amides such as N-methylformamide, N,N-dimethylformamide, N,N-dimethylacetamide, N-methyl-2-pyrrolidone and the like; lactones such as .gamma.-butyrolactone and the like; esters such as propyl acetate, butyl acetate, butyl propionate, ethyl butyrate, butyl butyrate, methyl lactate, ethyl lactate and the like; ketones such as acetone, methyl ethyl ketone, acetyl acetone, methyl butyl ketone, 3-pentanone, 2-heptanone and the like; ethers such as diethyl ether, dipropyl ether, dibutyl ether, oxirane, dioxane and the like; glycol monoethers such as ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, diethylene glycol monobutyl ether, triethylene glycol monomethyl ether and the like; sulfolanes such as sulfolane and the like; sulfoxides such as dimethyl sulfoxide and the like; urea compounds such as dimethylimidazolidinone and the like; hydrocarbons such as pentane, hexane, heptane, cyclohexane and the like; and other solvents. Among other, water-soluble organic solvents having solubility in water of 8% or more are preferable.
- 31 Examples of a water-soluble organic solvent in the present invention include alcohols such as methanol, ethanol, n-propyl alcohol, isopropyl alcohol, ethylene glycol, glycerin and the like; amides such as N-methylformamide, N,N-dimethylformamide, N,N-dimethylacetamide, N-methyl-2-pyrrolidone and the like; lactones such as .gamma.-butyrolactone and the like; esters such as methyl lactate, ethyl lactate and the like; ketones such as acetone, methyl ethyl ketone, acetyl acetone and the like; ethers such as ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, diethylene glycol monobutyl ether, triethylene glycol monomethyl ether and the like; sulfolanes such as sulfolane and the like; sulfoxides such as dimethyl sulfoxide and the like; urea compounds such as dimethylimidazolidinone and the like; and other solvents. Further preferably, N-methyl-2-pyrrolidone, methanol, dimethylsulfoxide and the like are listed. These water-soluble organic solvents may be used alone or in combination thereof.
- 32 It is preferable that a remover composition of the present invention further contains an organic amines. Regarding ratio thereof, a remover composition comprises a remover composition which is obtained by adding a cyclic urea compound of the above-described general formula (I) into water and/or water-

soluble organic solvent in an amount of 1 to 90% by weight, or which contains this cyclic urea compound in water and/or water-soluble organic solvent, in a ratio of 100 parts by weight, and organic amines preferably in a ratio of from 0.1 to 150 parts by weight, further preferably from 1.0 to 100 parts by weight, particularly preferably from 5.0 to 50 parts by weight.

- 33 When the ratio of the organic amines is over 150 parts by weight, corrosion may occur on a conductive metal and insulation film on a substrate, and when less than 0.1 part by weight, removing property on a resist and etching residue may be insufficient.
- 34 The organic amines are selected from the group consisting of alkanol amines and alkylammonium hydroxides. These organic amines may be used alone or in combination of two or more. As the above-mentioned alkanol amine, monoethanolamine, diethanolamine, triethanolamine, 2-(2-aminoethoxy)ethanol and the like are listed. As the above-mentioned alkylammonium hydroxide, tetramethylammonium hydroxide, tetraethylammonium hydroxide and the like are listed. These organic amines may be used alone or in combination of two or more.
- 35 It is preferable that a remover composition of the present invention contains additives. Further, it is preferable that a remover composition of the present invention contains additives in addition to the above-mentioned organic amines.
- 36 Regarding specific ratio thereof, a remover composition of the present invention comprises the above-mentioned remover composition, in a ratio of 100 parts by weight, and additives, in a ratio of from 0.001 to 100 parts by weight, preferably from 0.1 to 50 parts by weight, particularly preferably from 1.0 to 25 parts by weight. The abovementioned addition amount of additives is likewise applied to also a remover composition obtained by adding organic amines.
- 37 As the additive, reducing agents and chelating agents, particularly those having an effect as a corrosion inhibitor of metals can be used. For example, aromatic hydroxy compounds, triazole compounds and the like are listed. These may be used alone or in combination of two or more. When the concentration of the additive is over 100 parts by weight, the additive may remain on a substrate after remover treatment, while, when less than 0.001 part by weight, corrosion of a metal film on substrate may occur.
- 38 As the above-mentioned aromatic hydroxy compound, hydroquinone, catechol, resorcinol, pyrogallol and the like are listed, and of them, catechol is preferable. As the above-mentioned triazole compound, benzotriazole, carboxybenzotriazole, 1-hydroxybenzotriazole, 3-aminotriazole and the like are listed, and of them, benzotriazole is preferable. As other additives, polyethyleneimine, thioglycerol and the like can be listed. These compounds may be used alone or in combination thereof.
- 39 A remover composition of the present invention has extremely low corrosive effect on materials such as an insulation film and a metal film (made of aluminum, tungsten, copper, platinum and the like) constituting a semiconductor in a process of producing semiconductors such as a LSI element, liquid crystal panel and the like, and is suitable for copper or aluminum in particular.
- 40 A cyclic urea compound of the general formula (I) can be obtained by reacting corresponding urea compound or thiourea compound with glyoxal according to an

ordinary method, or introducing an N-substituent into a reaction product (R.sub.1.dbd.R.sub.2.dbd.H in the general formula (I)) of a urea compound or thiourea compound with glyoxal according to an ordinary method.

- 41 For obtaining a remover composition of the present invention, the above-mentioned compounds may advantageously be mixed in given amounts. The mixing method is not particularly restricted, and various known methods are applied.
- 42 A remover composition of the present invention has an excellent ability to remove a photoresist and a residue formed in conducting a dry etching treatment, and can suppress corrosion property on materials such as an insulation film, metal film and the like constituting a semiconductor element, consequently, can be suitably used in a process for cleaning semiconductor elements such as an LSI element, liquid crystal panel and the like.
- 43 In a process for removing a photoresist of the present invention, a photoresist is removed by using a remover composition of the present invention in a process of producing a semiconductor element.
- 44 In a process for removing a residue of a semiconductor element of the present invention, a residue formed in producing a semiconductor, particularly in a dry etching treatment is removed by using a remover composition of the present invention in a process of producing a semiconductor element.
- 45 The residue herein referred to means an ashing residue, etching residue, side-wall polymer and the like.
- 46 Specifically, for removing a resist and etching residue by using a remover composition of the present invention, for example, an LSI element and a liquid crystal panel element may advantageously be washed by a remover composition of the present invention using an immersion method or a spray washing method at a temperature in the range from 10 to 100.degree. C.
- 47 A remover composition of the present invention has an excellent ability to remove a photoresist and a residue formed in conducting a dry etching treatment, and has extremely low corrosive effect on materials such as an insulation film, metal film and the like constituting a semiconductor element, consequently, can be suitably used in a process for cleaning semiconductor elements such as an LSI element, liquid crystal panel and the like.

DETAILED DESCRIPTION:

1 EXAMPLES

2 The following examples will illustrate the present invention further in detail below, but do not limit the scope of the present invention.

3 Examples 1 to 4

4 On a substrate comprising a silicon wafer carrying thereon a first layer, silicon nitride (Si.sub.3 N.sub.4) layer, a second layer, copper layer laminated on the first layer, and a third layer, insulation film (silicon oxide (SiO.sub.2)) layer laminated on the second layer, via holes were formed according to dry etching by using a resist film as a mask, subsequently, the

resist film was removed according to ashing by using oxygen plasma. Residues which could not be removed by oxygen plasma were present on the upper side parts of the insulation film, side wall parts of the via holes, and bottom parts of the via holes.

- 5 This wafer was immersed in a remover composition shown in Table 1 under treating conditions as shown in Table 2, and rinsed with ultrapure water and dried, and was observed by a scanning electron microscope (SEM). Removing property of the residues and corrosive effect on the copper layer were evaluated and the results are shown in Table 2. The evaluation criteria in the SEM observation are as follows.
- 6 (Removing Property) .circleincircle.: removed completely .DELTA.: partial remaining was recognized X: most parts remained
- 7 (Corrosion Inhibitive Effect) .circleincircle.: corrosion was not recognized at all .DELTA.: partial corrosion was recognized X: sever corrosion was recognized

TABLE 1

Compound of				Water-soluble					
the formula (I)				Water	organic solvent		Organic amines		
Additives									
Parts				Parts	Parts		Parts		
Parts				Parts	Parts		Parts		
by				by	by		by		
by				by	by		by		
No.	Kind	weight	Kind	weight	Kind	weight	Kind	weight	Kind
weight									
Examples									
1	A	53.8	Water	38.5	Metha-	7.7	MEA	30.8	Cate-
23.1					nol				chol
2	B	34.6	Water	57.7	Metha-	7.7	MEA	30.8	Cate
23.1					nol				chol
3	B	29.0	Water	34.8	NMP	36.2	MEA	29.0	Cate-
14.5									

chol

BTA

1.4

4 C 53.8 Water 38.5 Metha- 7.7 MEA 30.8 Cate-

23.1

nol

chol

A: 4,5-dihydroxy-1,3-dimethyl-2-imidazolidinone

B: 4,5-dihydroxy-1,3-bis(hydroxymethyl)-2-imidazolidinone

C: 4,5-dihydroxy-1,3-bis(methoxymethyl)-2-imidazolidinone

MEA: monoethanolamine

NMP: N-methyl-2-pyrrolidone

BTA: 1,2,3-benzotriazole

TABLE 2

Corrosive

	Treating conditions			Removing inhibitive	
	No.	Temperature	Time (min.)	property	effect
Examples	1	70	20	.circleincircle.	.circleincircle.
	2	70	20	.circleincircle.	.circleincircle.
	3	70	20	.circleincircle.	.circleincircle.
	4	70	20	.circleincircle.	.circleincircle.

CLAIMS:

What is claimed is:

1. A remover composition, comprising: 100 parts by weight of a remover composition, wherein said remover composition is obtained by adding 1 to 90% by weight of a cyclic urea compound, to water, water-soluble organic solvent, or water and water-soluble organic solvent, said cyclic urea compound represented by the following general formula (I): ##STR3##

wherein, each of R.sub.1 and R.sub.2 independently represents a hydrogen atom, hydroxyl group, carboxyl group or alkyl group which may be substituted, and Z represents an oxygen atom or sulfur atom; and 0.001 to 100 parts by weight of additives, wherein the additives are selected from the group consisting of aromatic hydroxy compounds and triazole compounds.

2. A remover composition, comprising: 100 parts by weight of a remover composition, wherein said remover composition is obtained by adding 1 to 90%

by weight of a cyclic urea compound, to water, water-soluble organic solvent, or water and water-soluble organic solvent, said cyclic urea compound represented by the following general formula (I): ##STR4## wherein, each of R.sub.1 and R.sub.2 independently represents a hydrogen atom, hydroxyl group, carboxyl group or alkyl group which may be substituted, and Z represents an oxygen atom or sulfur atom; 0.1 to 150 parts by weight of organic amines; and 0.001 to 100 parts by weight of additives, wherein the additives are selected from the group consisting of aromatic hydroxy compounds and triazole compounds.

3. A remover composition, comprising: 100 parts by weight of a remover composition, wherein said remover composition comprises 1 to 90% by weight of a cyclic urea compound in water, water-soluble organic solvent, or water and water-soluble organic solvent, said cyclic urea compound represented by the following general formula (I): ##STR5##

wherein, each of R.sub.1 and R.sub.2 independently represents a hydrogen atom, hydroxyl group, carboxyl group or alkyl group which may be substituted, and Z represents an oxygen atom or sulfur atom; and 0.001 to 100 parts by weight of additives, wherein the additives are selected from the group consisting of aromatic hydroxy compounds and triazole compounds.

4. A remover composition comprising: 100 parts by weight of a remover composition, wherein said remover composition comprises 1 to 90% by weight of a cyclic urea compound in water, water-soluble organic solvent, or water and water-soluble organic solvent, said cyclic urea compound represented by the following general formula (I): ##STR6##

wherein, each of R.sub.1 and R.sub.2 independently represents a hydrogen atom, hydroxyl group, carboxyl group or alkyl group which may be substituted, and Z represents an oxygen atom or sulfur atom; 0.1 to 150 parts by weight of organic amines; and 0.001 to 100 parts by weight of additives, wherein the additives are selected from the group consisting of aromatic hydroxy compounds and triazole compounds.

5. The remover composition as in any one of claims 1, 2, 3, or 4, wherein said additive is catechol.

6. The remover composition as in any one of claims 1, 2, 3, or 4, wherein said additive is benzotriazole.

7. A process for removing a photoresist by using a remover composition according to claim 1.

8. A process for removing a residue of a semiconductor element, wherein a residue formed in producing semiconductor is removed by using a remover composition according to claim 1.

9. The process for removing a residue of a semiconductor element according to claim 8, wherein the residue formed in producing semiconductor is the residue formed by a dry etching treatment.

10. A process for removing a photoresist by using a remover composition according to claim 3.

11. A process for removing a residue of a semiconductor element, wherein the residue formed in producing semiconductor is removed by using a remover

composition according to claim 3.

12. The process for removing a residue of a semiconductor element according to claim 11, wherein the residue formed in producing semiconductor is the residue formed by a dry etching treatment.

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TITLE: Dibasic ester stripping compositionAbstract Text (1):

A mixture of a dibasic ester (DBE), an alcohol, a polar solvent and water to remove photoresist from a flat panel substrate. Photoresist is effectively removed at low temperature with this non-phenolic, non-halogenated stripper solution.

Brief Summary Text (3):

This invention is directed to a composition and method for removal of photoresist materials from a substrate, such as a flat panel display. Mixtures of a dibasic ester (DBE), an alcohol, a polar organic solvent, and water are used to strip hard to remove photoresist materials, such as photoresist which has been subjected to baking process, without damaging the substrate. The method is effective at low temperatures (50-70.degree. C.).

Brief Summary Text (6):

Further processing of the photoresist materials after developing, such as high temperature post exposure bake, ion implantation and deep UV radiation hardening lead to highly crosslinked photoresist materials which are extremely resistant to dissolution in most conventionally employed organic strippers. Halogenated and phenolic hydrocarbon solvents have been used to remove these extremely resistant photoresist materials. Use of these types of solvents is undesirable due to the hazards they pose to technicians carrying out the stripping process and due to the potential pollution and environmental problems associated with disposal of the waste product. Alkaline strippers have also been utilized to remove these resistant photoresist materials. Use of these types of strippers is undesirable due to the corrosion they cause to substrates containing metal films, particularly aluminum or various combinations or alloys of active metals such as copper or tungsten.

Brief Summary Text (18):

Briefly, the preferred embodiments of the present invention utilizes a mixture of a dibasic ester (DBE), an alcohol, a polar organic solvent, and water to remove photoresist from a flat panel substrate. The process is effective at low temperature.

Detailed Description Text (2):

a. Integrated Circuit Processing. This invention provides a process for stripping photoresist from a substrate, even if the photoresist has been baked and exposed to short wavelength hardening radiation. The composition and method are effective at ambient temperature (20.degree. C. to 40.degree. C.), and a synergistic effect enhancing the effectiveness of the stripper is noted when a mixture comprising water, a dibasic ester, and an alcohol is used. The stripping composition is comprised of: (a) from 5% to 95% by weight of a dibasic ester (or mixture of such ethers) having the general formula: ##STR1## in which n is an integer from 1 to 5, and R.sub.1 and R.sub.2 are alkyl groups of 1 to 4 carbons; (b) from 1% to 65% by weight of tetrahydrofurfuryl alcohol or a water soluble alcohol, glycol, or glycol ether compound having the general formula R--(CHOH).sub.n --R' where R and R' denote hydrogen atoms, or alkyl groups of 1 to 7 carbons, or alkoxy groups of 1 to 4 carbons, and n=1-3 (higher boiling alcohols, glycols, etc. are preferred if

processing will occur at elevated temperatures); and (c) from 5% to 60% by weight deionized water. Other ingredients such as wetting agents, surfactants, dyes or colorants may be added to the stripping composition for specific applications.

Detailed Description Text (3):

It is more preferred that the photoresist stripper composition contain from 15%-85% by weight of the dibasic ester, from 10%-80% by weight of the alcohol/glycol/glycol ether and from 5%-60% by weight deionized water. It is yet more preferred that the photoresist stripper composition contain from 25%-75% by weight of the dibasic ester, from 20%-70% by weight of the alcohol/glycol/glycol ether and from 25%-55% by weight deionized water. In its most preferred embodiment, the photoresist stripper composition comprises from 25%-50% by weight of the dibasic ester, from 30%-50% by weight of the alcohol/glycol/glycol ether and from 25%-55% by weight deionized water.

Detailed Description Text (4):

As discussed below, the performance of the stripper of the present invention is enhanced when the combination of dibasic ester, alcohol/glycol/glycol ether, and water is used. The chemical nature of this synergistic effect is not known. However, dibasic ethers are generally not soluble in water, and the alcohol/glycol/glycol ether component allows creation of a single phase mixture. Thus, the percentages of the components may be adjusted, but should be within ranges where a single phase mixture is obtained. The percentages of the components (and the particular dibasic esters and alcohol/glycol/glycol ether components), strip time, and strip temperature can be adjusted to address particular photoresist stripping requirements.

Detailed Description Text (7):

Examples of suitable dibasic esters are dimethyl adipate, ##STR2##

Detailed Description Text (10):

Mixtures of such esters may also be utilized. Suitable alcohols are ethanol, methanol, 2-propanol, n-propanol, n-butanol, n-pentanol, n-hexanol, n-heptanol, tetrahydrofurfuryl alcohol, ethylene glycol, propylene glycol, and glycol derivatives such as ethylene glycol and propylene glycol ethers.

Detailed Description Text (11):

The following test data demonstrate the synergistic effect of a composition including a dibasic ester, an alcohol, and water. In general, dibasic esters are insoluble or only slightly soluble in water. The use of an alcohol allows creation of a solution in which a dibasic ester and water may be mixed to create a homogenous solution.

Detailed Description Text (12):

Table 1 illustrates the stripping effect when a wafer coated with photoresist is stripped using a dibasic ester by itself. Wafers were prepared by conventional methods using three different positive photoresists: Shipley 1400 series (Shipley Company, Inc.), KTI-820 (OCG Chemicals), and AZ-1500 series (American Hoechst). Wafers were coated with photoresist, prebaked at 60.degree. C., exposed to UV radiation, post-baked at 120.degree. C., and then stripped at ambient temperature (26.degree. C.) using the test solvents in Table 1. The stripping test was conducted by immersing the wafer in the solvent bath for 5 minutes with frequent agitation. The wafer was then removed, rinsed with deionized water, spin-dried, and tested for photoresist residue.

Detailed Description Text (14):

Table 2 illustrates results achieved with a 1:1:1 by volume ratio mixture of dimethyl adipate, dimethyl glutarate, and dimethyl succinate mixed with an alcohol at 50% by weight. Wafers were baked at 150.degree. C. and stripping time was 5 minutes at 25.degree. C. Wafer cleanliness was rated from 1 to 10, where 1

indicates 90% residue, 5 indicates 50% residue, and 10 indicates 0% residue (100% clean).

Detailed Description Text (16):

Table 3 illustrates stripping results achieved with a mixture of (a) from 30% to 40% by weight of a dibasic ester mixture (1:1:1 ratio by weight of dimethyl adipate, dimethyl glutarate, and dimethyl succinate (this mixture is identified as DBE1:1:1 in Tables 3 and 5); (b) 20% to 30% alcohol by weight; and (c) 35% to 50% deionized water by weight. The wafers used were baked at 120.degree. C. and a stripping time of 5 minutes at 25.degree. C. was used. Wafer cleanliness was rated from 1 to 10.

Detailed Description Text (21):

In practicing the method of the present invention, the substrate (usually a silicon wafer) and photoresist are contacted with the photoresist stripper solution at ambient temperature for a stripping time sufficient to remove the photoresist from the substrate. Elevated temperature (60.degree. C. to 80.degree. C.) may be used for particularly difficult to remove resist, and at such temperatures a higher boiling alcohol should be used. The stripping time at ambient temperature (25.degree. C.) is generally approximately 2-3 minutes.

Detailed Description Text (23):

The method for removing photoresist from flat panel displays is similar to that for semiconductor wafers, with the addition of a polar organic solvent. LCD/TFT panels were patterned and metalized with techniques known in the art, coated with positive photoresist, baked on a hot plate, and hard baked in an oven using conventional methods. An immersion bath of the present formulation was heated to 50-70.degree. C. The panels were placed in the bath and stripped to complete removal of the resist material. The stripping composition is comprised of: (a) from 5% to 95% by weight DBE (as discussed above for the IC formulation); (b) from 1% to 65% by weight alcohol/glycol/glycolether (as discussed above for the IC formulation); (c) from 5% to 70% by weight of a polar organic solvent or mixtures thereof selected from dimethyl sulfoxide (DMSO), n-hydroxyethyl-pyrrolidinone (HEP), n-methyl pyrrolidinone (NMP), other pyrrolidinones, tetramethylsulfone (sulfolane), or other alkyl sulfoxide or sulfone compounds; and (d) from 5% to 60% by weight deionized water.

Detailed Description Text (24):

It is most preferred that the composition contain from 20% to 40% DBE, 20% to 40% alcohol/glycol/ether, 20% to 50% polar organic solvent, and 10% to 30% water.

Detailed Description Text (28):

Table 7 illustrates stripping results with DBE 1:1:1, glycol ether DPM (Dawanol DPM), DMSO, and water.

Detailed Description Text (29):

Table 8 illustrates stripping results with DBE 1:1:1, glycol ether DPM (Dawanol DPM), sulfolane, and water.

Detailed Description Text (30):

Table 9 illustrates stripping results with DBE 1:1:1, glycol ether DPM (Dawanol DPM), HEP, and water.

Detailed Description Paragraph Table (1):

TABLE 1 Shipley-601 KTI-820 Solvent (Percent of Photoresist Removed) AZ-4110
Dimethyl Succinate 45% 40% 25% Dimethyl Glutarate 30-35% 15-20% 15-20% Dimethyl
Adipate 35-40% 15-20% 10-15% DMES Mixed* 60-65% 55-60% 25-40% *DMES Mixed denotes
dimethyl aliphatic esters (dibasic esters manufactured by Dupont). DMES Mixed is
comprised of the following esters (by weight percentage): dimethyl succinate 17%,
dimethyl adipate 17%, dimethyl glutarate 66%.

Detailed Description Paragraph Table (2):

TABLE 2 ALCOHOL USED SHIPLEY-601 KTI-820 AZ-4110 Ethanol 7 8 6 Isopropanol 6 7 5 n-Propanol 7 8 6 n-Butanol 5 6 4 Tetrahydrofurfuryl alcohol 4 5 4

Detailed Description Paragraph Table (3):

TABLE 3 SHIPLEY- COMPOSITION 601 KTI-820 AZ-4110 1. 30% DBE1:1:1 8 10 8 20% Ethanol 50% Water 2. 30% DBE1:1:1 8 10 9 30% Isopropanol 40% Water 3. 30% DBE1:1:1 10 10 10 30% n-butanol 40% Water 4 35% DBE1:1:1 10 10 10 30% Tetrahydrofurfuryl alcohol 35% Water

Detailed Description Paragraph Table (5):

TABLE 5 PHOTO- DBE COMPOUND ALCOHOL RESIST STRIP EXAMPLE (% WEIGHT) (% WEIGHT) RESIDUE TIME 1 Dimethyl Ethanol (15%) None <1 min. Succinate (30%) 2 Dimethyl Isopropanol None 1-2 Adipate (30%) (15%) min 3 Dimethyl n-Propanol None <1 min. Glutarate (30%) (20%) 4 DBE1:1:1 n-Butanol None <1 min. (36%) (20%) 5 DBES Mixed n-Propanol None <1 min. (36%) (25%)

Current US Original Classification (1):

134/2

Current US Cross Reference Classification (1):

134/29

Current US Cross Reference Classification (2):

134/38

CLAIMS:

1. A method for removing photoresist from a substrate comprising contacting said substrate with a stripping solution for a time sufficient to remove said photoresist from said substrate, said stripping solution consisting essentially of: (a) from about 5% to about 95% by weight of one or more dibasic esters having the general formula:

R.sub.1 CO.sub.2 --(CH.sub.2).sub.n --CO.sub.2 R.sub.2 where R.sub.1 and R.sub.2 are alkyl groups of 1-4 carbons and n =1-5; (b) from about 1% to about 65% by weight of tetrahydrofurfuryl alcohol or a water soluble alcohol, glycol, glycol ether, or mixtures thereof having the general formula:

R--(CHOH).sub.n --R' where R and R' are selected from the group consisting of a hydrogen atom, an alkyl group of 1 to 7 carbon atoms, and an alkoxy group of 1 to 4 carbon atoms, n=1-3; (c) from about 5% to about 70% by weight of an organic solvent selected from the group consisting of dimethyl sulfoxide, n-hydroxyethyl-pyrrolidinone, n-methyl pyrrolidinone, sulfolane, and mixtures thereof; and (d) from about 5% to about 60% by weight of deionized water.

2. The method of claim 1 where the dibasic ester is present in an amount of from about 25% to about 50% by weight.

3. The method of claim 1 where the water soluble alcohol, glycol, glycol ether, or mixture thereof, is present in an amount of from about 30% to about 50% by weight.

6. The method of claim 1 where the dibasic ester is selected from the group consisting of dimethyl adipate, dimethyl glutarate and dimethyl succinate.

7. The method of claim 1 where the water soluble alcohol is selected from the group consisting of ethanol, methanol, 2-propanol, n-propanol, n-butanol, n-pentanol, n-hexanol, and n-heptanol.

8. The method of claim 1 where the glycol or glycol ether is selected from the group consisting of ethylene glycol, propylene glycol, ethylene glycol ethers, and propylene glycol ethers.

9. The method of claim 1 where (a) the dibasic esters are present in an amount of from about 25% to about 50% by weight, and are selected from the group consisting of dimethyl adipate, dimethyl glutarate and dimethyl succinate; (b) the alcohol, glycol, glycol ether, or mixture thereof is present in an amount of from about 30% to about 50% by weight, and are selected from the group consisting of ethanol, methanol, 2-propanol, n-propanol, n-butanol, n-pentanol, n-hexanol, n-heptanol, tetrahydrofurfuryl alcohol, ethylene glycol, propylene glycol, ethylene glycol ethers, and propylene glycol ethers; (c) the organic solvent, or mixture thereof, is present in an amount of from about 20% to about 50% by weight; and (d) the deionized water is present in an amount of from about 25% to about 55% by weight.

10. A method of removing photoresist from a substrate comprising contacting said substrate with a stripping solution for a time sufficient to remove said photoresist from said substrate, wherein said stripping solution consists essentially of: (a) from about 2% to about 45% by weight of one or more dibasic esters having the general formula:

R.sub.1 CO.sub.2 --(CH.sub.2).sub.n --CO.sub.2 R.sub.2 where R.sub.1 and R.sub.2 are alkyl groups of 1-4 carbons and n=1-5; (b) from about 1% to about 40% by weight of tetrahydrofurfuryl alcohol or a water soluble alcohol, glycol, glycol ether, or mixtures thereof having the general formula:

R--(CHOH).sub.n --R' where R and R' are selected from the group consisting of a hydrogen atom, an alkyl group of 1 to 7 carbon atoms, and an alkoxy group of 1 to 4 carbon atoms, n=1-3; (c) from about 2% to about 35% by weight of an organic solvent selected from the group consisting of dimethyl sulfoxide, n-hydroxyethyl-pyrrolidinone, n-methyl pyrrolidinone, sulfolane, and mixtures thereof; and (d) from about 5% to about 60% by weight deionized water; and (e) from about 5% to about 60% by weight of an amine selected from the group consisting of monoethanolamine, monoisopropanolamine, aminoethylethanolamine, diglycolamine, and mixtures thereof.

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L6: Entry 33 of 120

File: USPT

Sep 9, 2003

DOCUMENT-IDENTIFIER: US 6616773 B1

TITLE: Substrate treatment method

Brief Summary Text (5):

In micromachining processes for manufacturing processes for semiconductor devices such as ICs, LSIs, etc., photosensitive organic macromolecular compounds are applied to a semiconductor substrate of silicon or the like, or to a glass substrate, a photoresist is developed after exposing the substrate to ultraviolet light through a photomask formed with a predetermined pattern for a circuit, etc., to form a photoresist pattern on the substrate, a film may be formed by chemical vapor deposition (CVD), sputtering, etc., on the portions of the substrate where the photoresist pattern has not been formed, and etching by chemicals, reactive ion etching (RIE), heat diffusion of impurities, and ion implantation may be performed. Then, the film of photoresist remaining on the substrate after this series of treatments is removed by chemical treatment, but in manufacturing processes for LSIs, etc., this operation of applying photoresist and removing the photoresist film after performing a variety of treatments is generally carried out not just once, but several times.

Brief Summary Text (19):

A cleaning process may be included after the wet ozone-containing gas treatment process, the cleaning process including cleaning the substrate with a cleaning solution containing at least one organic solvent chosen from a group including pure water, acidic aqueous solutions, alkaline aqueous solutions, ketones, and alcohols.

Detailed Description Text (97):

Each of the above embodiments has been explained for cases using pure water as the cleaning solution, but photoresist removal speed can be further improved if a solution is used which easily dissolves photoresist molecules which have been reduced to a low molecular weight. Embodiment 12 was made with this in mind. The cleaning solution in this Embodiment 12 is preferably a solution which easily dissolves photoresist film after reaction with ozone and can be selected from a group including: pure water and ultrapure water; acidic aqueous solutions of sulfuric acid, hydrochloric acid, nitric acid, acetic acid, hydrogen peroxide, or the like; alkaline aqueous solutions of ammonium hydroxide or the like; organic solvents including ketones such as acetone and alcohols such as isopropanol; and mixtures of the above.

Detailed Description Text (98):

In the semiconductor manufacturing process in particular, it is useful to add minute quantities of chemicals such as the above acidic aqueous solutions, alkaline aqueous solutions, ketones, alcohols, etc., to the cleaning solution to remove residues which have caked after etching or where ions have been doped in high concentration (10.sup.15 /cm.sup.2, for example), etc.

Detailed Description Text (132):

Consequently, as disclosed in Embodiment 12, the treatment solution can be selected from a group including: pure water and ultrapure water; acidic aqueous solutions of sulfuric acid, hydrochloric acid, nitric acid, acetic acid, hydrogen peroxide, or

the like; alkaline aqueous solutions of ammonium hydroxide or the like; organic solvents including ketones such as acetone and alcohols such as isopropanol; and mixtures of the above. As explained previously, in the semiconductor manufacturing process in particular, it is useful to add minute quantities of chemicals such as the above acidic aqueous solutions, alkaline aqueous solutions, ketones, alcohols, or the like to remove residues which have caked after etching or where ions have been doped in high concentration (10.sup.5 /cm.sup.2, for example), etc.

Detailed Description Text (151):

A cleaning process may be included after the wet ozone-containing gas treatment process, the cleaning process including cleaning the substrate with a cleaning solution containing at least one organic solvent chosen from a group including pure water, acidic aqueous solutions, alkaline aqueous solutions, ketones, and alcohols, enabling the substrate treatment speed to be further increased.

Current US Original Classification (1):

134/26

Current US Cross Reference Classification (1):

134/1.3

Current US Cross Reference Classification (2):

134/2

Current US Cross Reference Classification (3):

134/3

Current US Cross Reference Classification (4):

134/31

Current US Cross Reference Classification (5):

134/37

CLAIMS:

3. A substrate treatment method comprising: treating a work object on a surface of a substrate at a temperature by supplying to the work object a wet ozone-containing gas wetted with a treatment solution, wherein the wet ozone-containing gas contains a concentration of vapor of the treatment solution larger than a saturation vapor level of the treatment solution at the temperature of the substrate; and after treating the work object with the wet ozone-containing gas, cleaning the substrate with a cleaning solution containing at least one solvent chosen from the group consisting of pure water, acidic aqueous solutions, alkaline aqueous solutions, ketones, and alcohols.

6. The substrate treatment method according to claim 2 comprising, after treating the work object with the wet ozone-containing gas, cleaning the substrate with a cleaning solution containing at least one solvent chosen from the group consisting of pure water, acidic aqueous solutions, alkaline aqueous solutions, ketones, and alcohols.

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L6: Entry 24 of 120

File: USPT

Mar 16, 2004

DOCUMENT-IDENTIFIER: US 6706641 B2

TITLE: Spray member and method for using the same

Brief Summary Text (5):

Contaminants removed from surface features of microelectronic substrates after various manufacturing steps (e.g., after post-ion implant, 'back end of the line' (BEOL) cleans, 'front end of the line' (FEOL) cleans, and post chemical mechanical planarization (CMP) steps) vary in nature and composition dramatically. Accordingly, cleaning and treating steps must address these contaminants with the appropriate chemistries and solvents to either react with, ionize, dissolve, swell, disperse, emulsify, or vaporize them from the substrate. As such, a variety of water and solvent-based systems, and dry cleaning processes have been developed to address the broad variety of waste materials.

Detailed Description Text (3):

The present invention relates generally to, inter alia, the cleaning or treating of microelectronic substrates (such as semiconductor substrates) during or subsequent to the manufacturing of integrated circuits, microelectronic devices, MEM's, MEOM's and opto-electronic devices. Removal of surface contaminants and particulates is a key step in the integrated circuit fabrication process. There are numerous cleaning steps (commonly referred to as "cleans") in the fabrication process. The different types of cleans include pre-diffusion cleans, front end of the line post-ash cleans, back end of the line post-etch cleans, pre-metal deposition cleans, front end of the line plasma strip, back end of the line clean/strip, post-ion implantation cleans and post-chemical mechanical planarization (CMP) cleans. There are many types and sources of particulates and contaminants in the fabrication process. The particles and contaminants may be molecular, ionic, atomic or gaseous in nature. The source may be inherent (e.g., redeposition of resist) or extrinsic to the process (e.g., wafer transport).

Detailed Description Text (6):

The wafer 5 may be, for example, a wafer of semiconductor material such as silicon, silicon oxide, gallium arsenide, etc. The wafer 5 has a substantially planar work surface 5A and an opposing substantially planar backside surface 5B. A continuous or discontinuous layer of waste material is disposed on the work surface 5A. The waste layer may be a layer of photoresist, reactive ion etch residue, chemical mechanical polishing residue or post-ion implantation residue. The waste material in the aforementioned layers may include inorganic or organic contaminants such as polymers based on styrenic, acrylic, novolac, cyclic olefinic maleic anhydride resins; etch residue based on ions of fluorine, chlorine, bromine or iodine; and slurry residue containing silica or alumina abrasives with other common slurry additives such as oxidizers, buffers, stabilizers, surfactants, passivating agents, complexing agents, corrosion inhibitors or other agents. Other types of workpieces may be cleaned or otherwise treated using the apparatus including, for example, MEMS, MEOMS, opto-electronic devices, and 3-D micro/nano-structures.

Detailed Description Text (11):

The chemistries provided by the supplies S1, S2, S3 may include, for example: water; oxidizers such as peroxides or permanganates; acids such as hydrofluoric, sulfuric, and nitric; bases such as secondary and tertiary amines; ammonium

hydroxide; solvents such as organic carbonates, lactones, ketones, ethers, alcohols, sulfoxides, thiols, and alkanes; surfactants such as block copolymers or random copolymers composed of fluorinated segments and hydrophilic or lipophilic segments; surfactants with siloxane-based components and hydrophilic or lipophilic components; conventional ionic and non-ionic hydrocarbon-based surfactants; and salts such as ammonium fluoride and choline. Incompatible chemistries are chemistries which, when combined or exposed to one another, tend to react with one another in a manner that impedes the process and/or damages or unduly fouls the apparatus 10 or wafer 5. Examples of incompatible chemistries include acids and bases.

Current US Cross Reference Classification (2):
134/198

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Inventor Name Search Result

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Last Name = RIGGS

First Name = DAVID

Application#	Patent#	Status	Date Filed	Title	Inventor Name 19
<u>60662281</u>	Not Issued	020	03/16/2005	RISER INSTALLATION FROM OFFSHORE PRODUCTION UNIT	RIGGS, DAVID C.
<u>60661358</u>	Not Issued	020	03/14/2005	RISER INSTALLATION FROM OFFSHORE PRODUCTION UNIT	RIGGS, DAVID C.
<u>60616532</u>	Not Issued	020	10/06/2004	RISER CONNECTOR	RIGGS, DAVID
<u>60612980</u>	Not Issued	020	09/24/2004	ROTATING LATCH CONNECTOR SYSTEM	RIGGS, DAVID C.
<u>60583327</u>	Not Issued	020	06/28/2004	METHOD OF RETRIEVING, REPAIRING AND REPLACING PIPELINE RISERS CONNECTED TO OFFSHORE FLOATING PRODUCTION SYSTEMS, TENSION LEG PLATFORMS AND FIXED STRUCTURES	RIGGS, DAVID C.
<u>60243404</u>	Not Issued	159	10/27/2000	THERMAL VAPORIZING DEVICE FOR DRUG DELIVERY	RIGGS, DAVID E.
<u>11100234</u>	Not Issued	020	03/31/2005	SAFE AND ARM DEVICE AND METHOD OF USING THE SAME	RIGGS, DAVID L.
<u>10950991</u>	Not Issued	030	09/27/2004	PAINTER'S AID	RIGGS, DAVID
<u>10709596</u>	Not Issued	030	05/17/2004	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	RIGGS, DAVID B.
<u>09984294</u>	Not Issued	161	10/29/2001	THERMAL VAPORIZING DEVICE FOR DRUG DELIVERY	RIGGS, DAVID
<u>09971820</u>	<u>6764551</u>	150	10/05/2001	PROCESS FOR REMOVING	RIGGS, DAVID B.

				DOPANT IONS FROM A SUBSTRATE	
<u>08910841</u>	<u>5951061</u>	150	08/13/1997	ELASTOMERIC SUBSEA FLEX JOINT AND SWIVEL FOR OFFSHORE RISERS	RIGGS, DAVID C.
<u>07641574</u>	<u>D333673</u>	150	01/16/1991	MARGIN SETTING FOR USE WITH A TYPEWRITER OR PRINTER	RIGGS, DAVID
<u>07587335</u>	Not Issued	161	09/21/1990	POOL SURFACE NET CLEANING SYSTEM	RIGGS, DAVID N.
<u>07145000</u>	<u>H000492</u>	150	01/15/1988	SAFE/ARM DEVICE	RIGGS, DAVID L.
<u>06674806</u>	Not Issued	089	11/26/1984	ELECTRO EXPLOSIVE FUZING DEVICE	RIGGS, DAVID L.
<u>06636823</u>	Not Issued	161	08/01/1983	FISH CLAW	RIGGS, DAVID N.
<u>06523499</u>	<u>4570658</u>	150	08/15/1983	PYROTECHNIC-ACTUATED DUAL AIR VALVE	RIGGS, DAVID L.

Inventor Search Completed: No Records to Display.

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Inventor Name Search Result

Your Search was:

Last Name = JAMMY

First Name = RAJARAO

Application#	Patent#	Status	Date Filed	Title	Inventor Name 50
<u>11118521</u>	Not Issued	030	04/29/2005	STABILIZATION OF FLATBAND VOLTAGES AND THRESHOLD VOLTAGES IN HAFNIUM OXIDE BASED SILICON TRANSISTORS FOR CMOS	JAMMY, RAJARAO
<u>11111592</u>	Not Issued	030	04/21/2005	USING METAL/METAL NITRIDE BILAYERS AS GATE ELECTRODES IN SELF-ALIGNED AGGRESSIVELY SCALED CMOS DEVICES	JAMMY, RAJARAO
<u>11050790</u>	Not Issued	019	01/27/2005	GATE STACK ENGINEERING BY ELECTROCHEMICAL PROCESSING UTILIZING THROUGH-GATE-DIELECTRIC CURRENT FLOW	JAMMY, RAJARAO
<u>11035392</u>	Not Issued	030	01/12/2005	FILLING HIGH ASPECT RATIO ISOLATION STRUCTURES WITH POLYSILAZANE BASED MATERIAL	JAMMY, RAJARAO
<u>11035369</u>	Not Issued	020	01/13/2005	METHOD OF FORMING HFSIN METAL FOR N-FET APPLICATIONS	JAMMY, RAJARAO
<u>10988733</u>	Not Issued	030	11/15/2004	NITROGEN-CONTAINING FIELD EFFECT TRANSISTOR GATE STACK CONTAINING A THRESHOLD VOLTAGE CONTROL LAYER FORMED VIA DEPOSITION OF A METAL OXIDE	JAMMY, RAJARAO
<u>10988532</u>	Not Issued	030	11/16/2004	REPLACEMENT METAL GATE TRANSISTOR WITH METAL-RICH SILICON LAYER AND METHOD FOR MAKING THE	JAMMY, RAJARAO

				SAME	
<u>10979633</u>	Not Issued	030	11/02/2004	DAMASCENE GATE FIELD EFFECT TRANSISTOR WITH AN INTERNAL SPACER STRUCTURE	JAMMY, RAJARAO
<u>10730892</u>	Not Issued	041	12/10/2003	FIELD EFFECT TRANSISTOR WITH ETCHED-BACK GATE DIELECTRIC	JAMMY, RAJARAO
<u>10707754</u>	Not Issued	041	01/09/2004	NITRIDED STI LINER OXIDE FOR REDUCED CORNER DEVICE IMPACT ON VERTICAL DEVICE PERFORMANCE	JAMMY, RAJARAO
<u>10682430</u>	<u>6873010</u>	150	10/10/2003	HIGH PERFORMANCE LOGIC AND HIGH DENSITY EMBEDDED DRAM WITH BORDERLESS CONTACT AND ANTISPACER	JAMMY, RAJARAO
<u>10604488</u>	Not Issued	083	07/25/2003	DRAM BURIED STRAP PROCESS WITH SILICON CARBIDE	JAMMY, RAJARAO
<u>10441887</u>	<u>6872620</u>	150	05/20/2003	TRENCH CAPACITORS WITH REDUCED POLYSILICON STRESS	JAMMY, RAJARAO
<u>10426336</u>	<u>6797582</u>	150	04/30/2003	VERTICAL THERMAL NITRIDE MASK (ANTI-COLLAR) AND PROCESSING THEREOF	JAMMY, RAJARAO
<u>10250092</u>	<u>6869860</u>	150	06/03/2003	FILLING HIGH ASPECT RATIO ISOLATION STRUCTURES WITH POLYSILAZANE BASED MATERIAL	JAMMY, RAJARAO
<u>10160540</u>	<u>6709926</u>	150	05/31/2002	HIGH PERFORMANCE LOGIC AND HIGH DENSITY EMBEDDED DRAM WITH BORDERLESS CONTACT AND ANTISPACER	JAMMY, RAJARAO
<u>10142518</u>	<u>6620724</u>	150	05/09/2002	LOW RESISTIVITY DEEP TRENCH FILL FOR DRAM AND EDAM APPLICATIONS	JAMMY, RAJARAO
<u>10137268</u>	<u>6664161</u>	150	05/01/2002	METHOD AND STRUCTURE FOR SALICIDE TRENCH CAPACITOR PLATE ELECTRODE	JAMMY, RAJARAO
<u>10064493</u>	<u>6794706</u>	150	07/22/2002	APPLICATIONS OF SPACE-CHARGE-LIMITED	JAMMY, RAJARAO

				CONDUCTION INDUCED CURRENT INCREASE IN NITRIDE-OXIDE DIELECTRIC CAPACITORS: VOLTAGE REGULATOR FOR POWER SUPPLY SYSTEM AND OTHERS	
<u>10016075</u>	<u>6613642</u>	150	12/13/2001	METHOD FOR SURFACE ROUGHNESS ENHANCEMENT IN SEMICONDUCTOR CAPACITOR MANUFACTURING	JAMMY, RAJARAO
<u>10013797</u>	Not Issued	071	12/10/2001	A 3-D MICROELECTRONIC STRUCTURE INCLUDING A VERTICAL THERMAL NITRIDE MASK	JAMMY, RAJARAO
<u>09971820</u>	<u>6764551</u>	150	10/05/2001	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	JAMMY, RAJARAO
<u>09902830</u>	<u>6512266</u>	150	07/11/2001	METHOD OF FABRICATING SIO2 SPACERS AND ANNEALING CAPS	JAMMY, RAJARAO
<u>09824385</u>	Not Issued	161	04/02/2001	METHOD FOR PREPARING THE SURFACE OF A DIELECTRIC	JAMMY, RAJARAO
<u>09777445</u>	Not Issued	161	02/06/2001	METHOD FOR SURFACE AREA ENHANCEMENT OF CAPACITORS BY FILM GROWTH AND SELF MASKING	JAMMY, RAJARAO
<u>09764656</u>	<u>6352892</u>	150	01/17/2001	METHOD OF MAKING DRAM TRENCH CAPACITOR	JAMMY, RAJARAO
<u>09723420</u>	<u>6555430</u>	150	11/28/2000	PROCESS FLOW FOR CAPACITANCE ENHANCEMENT IN A DRAM TRENCH	JAMMY, RAJARAO
<u>09702338</u>	<u>6583462</u>	150	10/31/2000	VERTICAL DRAM HAVING METALLIC NODE CONDUCTOR	JAMMY, RAJARAO
<u>09668988</u>	<u>6268299</u>	150	09/25/2000	VARIABLE STOICHIOMETRY SILICON NITRIDE BARRIER FILMS FOR TUNABLE ETCH SELECTIVITY AND ENHANCED HYDROGEN PERMEABILITY	JAMMY, RAJARAO
<u>09668638</u>	<u>6348388</u>	150	09/20/2000	PROCESS FOR FABRICATING	JAMMY,

				A UNIFORM GATE OXIDE OF A VERTICAL TRANSISTOR	RAJARAO
<u>09613197</u>	<u>6444516</u>	150	07/07/2000	SEMI-INSULATING DIFFUSION BARRIER FOR LOW-RESISTIVITY GATE CONDUCTORS	JAMMY, RAJARAO
<u>09607131</u>	<u>6399490</u>	150	06/29/2000	HIGHLY CONFORMAL TITANIUM NITRIDE DEPOSITION PROCESS FOR HIGH ASPECT RATIO STRUCTURES	JAMMY, RAJARAO
<u>09599261</u>	<u>6404000</u>	150	06/22/2000	PEDESTAL COLLAR STRUCTURE FOR HIGHER CHARGE RETENTION TIME IN TRENCH-TYPE DRAM CELLS	JAMMY, RAJARAO
<u>09594638</u>	<u>6707086</u>	150	06/15/2000	METHOD FOR FORMING CRYSTALLINE SILICON NITRIDE	JAMMY, RAJARAO
<u>09562556</u>	<u>6339007</u>	150	05/02/2000	CAPACITOR STACK STRUCTURE AND METHOD OF FABRICATING DESCRIPTION	JAMMY, RAJARAO
<u>09560081</u>	<u>6437381</u>	150	04/27/2000	SEMICONDUCTOR MEMORY DEVICE WITH REDUCED ORIENTATION-DEPENDENT OXIDATION IN TRENCH STRUCTURES	JAMMY, RAJARAO
<u>09559897</u>	<u>6310359</u>	150	04/26/2000	STRUCTURES CONTAINING QUANTUM CONDUCTIVE BARRIER LAYERS	JAMMY, RAJARAO
<u>09559884</u>	Not Issued	161	04/26/2000	PROCESS FOR FABRICATING A HIGH CAPACITANCE MEMORY CELL AND THE RESULTANT STRUCTURE	JAMMY, RAJARAO
<u>09559880</u>	<u>6399434</u>	150	04/26/2000	DOPED STRUCTURES CONTAINING DIFFUSION BARRIERS	JAMMY, RAJARAO
<u>09513582</u>	Not Issued	161	02/25/2000	METHOD AND STRUCTURE OF INCORPORATING RUTIL TIO ₂ AND HIGH K DIELECTRICS IN A DEEP TRENCH STORAGE CELL OF DRAM	JAMMY, RAJARAO
<u>09464508</u>	Not Issued	161	12/15/1999	METHOD FOR PREPARING THE SURFACE OF A DIELECTRIC	JAMMY, RAJARAO

09450546	6150670	150	11/30/1999	PROCESS FOR FABRICATING A UNIFORM GATE OXIDE OF A VERTICAL TRANSISTOR	JAMMY, RAJARAO
09363523	Not Issued	164	07/29/1999	METHOD FOR FORMING CRYSTALLINE SILICON NITRIDE	JAMMY, RAJARAO
09295136	6236077	150	04/20/1999	TRENCH ELECTRODE WITH INTERMEDIATE CONDUCTIVE BARRIER LAYER	JAMMY, RAJARAO
09295133	6259129	150	04/20/1999	STRAP WITH INTRINSICALLY CONDUCTIVE BARRIER	JAMMY, RAJARAO
09295132	6724088	150	04/20/1999	QUANTUM CONDUCTIVE BARRIER FOR CONTACT TO SHALLOW DIFFUSION REGION	JAMMY, RAJARAO
09239655	6333531	150	01/29/1999	IMPROVED DOPANT CONTROL OF SEMICONDUCTOR DEVICES	JAMMY, RAJARAO
09152835	6222218	150	09/14/1998	DRAM TRENCH	JAMMY, RAJARAO
09088890	Not Issued	161	06/02/1998	DEEP TRENCH-BASED DRAM AND METHOD OF FABRICATING	JAMMY, RAJARAO

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Day : Wednesday

Date: 6/22/2005
Time: 17:45:56 **PALM INTRANET****Inventor Name Search Result**

Your Search was:

Last Name = KIM

First Name = JOHN

Application#	Patent#	Status	Date Filed	Title	Inventor Name 46
60685745	Not Issued	020	05/27/2005	SEALED BLIND MECHANISMS	KIM, JOHN C.
60669044	Not Issued	020	04/07/2005	TRIGGER ACTIVATED LANCET	KIM, JOHN
60657895	Not Issued	020	03/02/2005	COMPOSITIONS AND METHODS THAT MODULATE RNA INTERFERENCE	KIM, JOHN
60634000	Not Issued	020	12/07/2004	SEALED WINDOW BLIND CONTROL MECHANISM	KIM, JOHN C.
60576141	Not Issued	159	06/02/2004	COMPOSITIONS AND METHODS THAT MODULATE RNA INTERFERENCE	KIM, JOHN
60562499	Not Issued	159	04/15/2004	COMPOSITIONS AND METHODS THAT MODULATE RNA INTERFERENCE	KIM, JOHN
60553645	Not Issued	159	03/15/2004	INVERSE SEARCH SYSTEMS AND METHODS	KIM, JOHN
60553644	Not Issued	159	03/15/2004	INTEGRATION OF PERSONALIZED PORTALS WITH WEB CONTENT SYNDICATION	KIM, JOHN
60553607	Not Issued	159	03/15/2004	SEARCH SYSTEM AND METHODS WITH INTEGRATION OF USER JUDGMENTS	KIM, JOHN
60553577	Not Issued	159	03/15/2004	SEARCH SYSTEM AND METHODS WITH INTEGRATION OF USER JUDGMENTS INCLUDING TRUST NETWORKS	KIM, JOHN
60514409	Not Issued	159	10/24/2003	MODIFYING FLEX-TYPE WINDOW SPACERS TO RECEIVE INTERNAL BLINDS	KIM, JOHN C.

				OR OTHER HARDWARE	
<u>60501577</u>	Not Issued	159	09/10/2003	SECURE GAMING ARCHITECTURE	KIM, JOHN
<u>60480409</u>	Not Issued	159	06/23/2003	CARRIER PROTEINS FOR VACCINES	KIM, JOHN
<u>60402605</u>	Not Issued	159	08/12/2002	PHOENIX 01 FIRE-ATTACK AIRCRAFT	KIM, JOHN
<u>60399949</u>	Not Issued	159	07/30/2002	CHIMERIC MULTIVALENT POLYSACCHARIDE CONJUGATE VACCINES	KIM, JOHN
<u>60297755</u>	Not Issued	159	06/14/2001	INSULATION DISPLACEMENT CONTACTS FOR SURGE PROTECTOR TERMINAL BLOCKS	KIM, JOHN
<u>29209243</u>	Not Issued	093	07/14/2004	GOLF BALL RETRIEVAL DEVICE	KIM, JOHN
<u>29125133</u>	<u>D439247</u>	150	06/19/2000	COMPUTER WITH INTEGRAL MONITOR	KIM, JOHN
<u>11106238</u>	Not Issued	019	04/14/2005	COMPOSITIONS AND METHODS THAT MODULATE RNA INTERFERENCE	KIM, JOHN
<u>11082128</u>	Not Issued	019	03/15/2005	INTEGRATION OF PERSONALIZED PORTALS WITH WEB CONTENT SYNDICATION	KIM, JOHN
<u>11017627</u>	Not Issued	019	12/20/2004	EPICARDIAL PATCH INCLUDING ISOLATED EXTRACELLULAR MATRIX WITH PACING ELECTRODES	KIM, JOHN
<u>10972702</u>	Not Issued	020	10/25/2004	MODIFYING U-SHAPED WINDOW SPACERS TO RECEIVE INTERNAL BLINDS OR OTHER HARDWARE	KIM, JOHN C.
<u>10912210</u>	Not Issued	030	08/05/2004	SEALED WINDOW LOUVER CONTROL MECHANISMS	KIM, JOHN C.
<u>10890265</u>	Not Issued	030	07/14/2004	GOLF BALL RETRIEVAL DEVICE	KIM, JOHN
<u>10801430</u>	Not Issued	030	03/16/2004	CONFIGURABLE ROOF RACK FOR AUTOMOBILES	KIM, JOHN
<u>10709596</u>	Not Issued	030	05/17/2004	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	KIM, JOHN
<u>10630223</u>	Not Issued	030	07/30/2003	CHIMERIC MULTIVALENT POLYSACCHARIDE CONJUGATE VACCINES	KIM, JOHN

<u>10315723</u>	Not Issued	092	12/10/2002	OPTOELECTRONIC DEVICES EMPLOYING FIBERS FOR LIGHT COLLECTION AND EMISSION	KIM, JOHN
<u>10230806</u>	<u>6649009</u>	150	08/29/2002	PROCESS FOR PLACING ONE FACETED STONE INSIDE A LARGER FACETED STONE TO FORM A SINGLE JEWELRY STONE	KIM, JOHN
<u>09971820</u>	<u>6764551</u>	150	10/05/2001	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	KIM, JOHN
<u>09874121</u>	Not Issued	161	06/05/2001	SELF-ALIGNED CORNER VT ENHANCEMENT WITH ISOLATION CHANNEL STOP BY ION IMPLANTATION	KIM, JOHN
<u>09865843</u>	Not Issued	161	05/25/2001	MESSAGE FLOW CONTROL USING PARTIALLY MONITORING OF AUTONOMOUS MESSAGES	KIM, JOHN
<u>09865248</u>	Not Issued	161	05/25/2001	EFFICIENT WATCHDOG MECHANISM FOR REDUCING TRAFFIC LOAD	KIM, JOHN
<u>09862369</u>	Not Issued	041	05/22/2001	USING SPREAD SCHEDULING TO AVOID NETWORK MANAGEMENT TRAFFIC BOTTLENECK AND REDUCE COMPUTING RESOURCE CONSUMPTION	KIM, JOHN
<u>09859923</u>	Not Issued	161	07/25/2001	ALARM SUMMARIZATION FOR EFFICIENT ALARM SYNCHRONIZATION	KIM, JOHN
<u>09455594</u>	Not Issued	160	12/06/1999	REAGENTS AND METHODS FOR THE DIAGNOSIS AND TREATMENT OF DIABETES AND STIFF MAN SYNDROME	KIM, JOHN
<u>09184818</u>	<u>6214141</u>	250	11/02/1998	DECORATIVE FLOCKING TECHNIQUES	KIM II, JOHN
<u>09154433</u>	<u>6048422</u>	150	09/16/1998	METHOD OF APPLYING GLITTER AND THE LIKE TO NON-PLANAR SURFACES AND THREE-DIMENSIONAL ARTICLES	KIM, JOHN
<u>08989829</u>	<u>6094361</u>	150	12/12/1997	ASSEMBLIES OF PRINTED CIRCUIT BOARDS AND FLEXIBLE CONTAINERS	KIM, JOHN

				THEREFOR	
<u>08971378</u>	<u>5934519</u>	150	11/17/1997	WEIGHTED DIP TUBE	KIM, JOHN
<u>08949017</u>	<u>5998584</u>	150	10/10/1997	REAGENTS AND METHODS FOR THE DIAGNOSIS AND TREATMENT OF DIABETES AND STIFF MAN SYNDROME	KIM, JOHN
<u>08450755</u>	<u>5849506</u>	150	05/25/1995	IMPROVED REAGENTS AND METHODS FOR THE DIAGNOSIS AND TREATMENT OF DIABETES AND STIFF MAN SYNDROME	KIM, JOHN
<u>08230510</u>	Not Issued	161	04/20/1994	TOOTHPICK WITH BRISTLE HEAD	KIM, JOHN
<u>08161290</u>	<u>5691448</u>	150	12/02/1993	REAGENTS AND METHODS FOR THE DIAGNOSIS AND TREATMENT OF DIABETES AND STIFF MAN SYNDROME	KIM, JOHN
<u>06089794</u>	<u>D262506</u>	150	10/31/1979	TABLE	KIM, JOHN

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Your Search was:

Last Name = LUCARINI

First Name = STEPHEN

Application#	Patent#	Status	Date Filed	Title	Inventor Name 4
10904661	Not Issued	030	11/22/2004	BARRIER DIELECTRIC STACK FOR SEAM PROTECTION	LUCARINI, STEPHEN M.
10904350	Not Issued	020	11/05/2004	SYSTEM AND METHOD FOR DETERMINING LINE WIDTHS OF FREE-STANDING STRUCTURES RESULTING FROM A SEMICONDUCTOR MANUFACTURING PROCESS	LUCARINI, STEPHEN M.
10709596	Not Issued	030	05/17/2004	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	LUCARINI, STEPHEN M.
09971820	6764551	150	10/05/2001	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	LUCARINI, STEPHEN M.

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Last Name = LUCARINI

First Name = STEPHEN

Application#	Patent#	Status	Date Filed	Title	Inventor Name 4
10904661	Not Issued	030	11/22/2004	BARRIER DIELECTRIC STACK FOR SEAM PROTECTION	LUCARINI, STEPHEN M.
10904350	Not Issued	020	11/05/2004	SYSTEM AND METHOD FOR DETERMINING LINE WIDTHS OF FREE-STANDING STRUCTURES RESULTING FROM A SEMICONDUCTOR MANUFACTURING PROCESS	LUCARINI, STEPHEN M.
10709596	Not Issued	030	05/17/2004	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	LUCARINI, STEPHEN M.
09971820	6764551	150	10/05/2001	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	LUCARINI, STEPHEN M.

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PALM INTRANET

Inventor Name Search Result

Your Search was:

Last Name = MACK

First Name = GEORGE

Application#	Patent#	Status	Date Filed	Title	Inventor Name 30
60537039	Not Issued	159	01/20/2004	EFFICIENT BATTERY POWERED ELECTRONIC PARKING METER	MACKAY, GEORGE
60330648	Not Issued	159	10/26/2001	PAY AND DISPLAY PARKING MACHINE WITH PARKING CITATION PAYMENT	MACKAY, GEORGE
60330069	Not Issued	159	10/19/2001	USE OF CELLULAR PHONES FOR PAYMENT OF VENDING MACHINES	MACKAY, GEORGE
29052585	Not Issued	161	04/05/1996	MAC AXE	MACKALL, GEORGE D.
10914762	Not Issued	030	08/09/2004	LOCATABLE DIELECTRIC OPTICAL FIBER CABLE HAVING EASILY REMOVABLE LOCATING ELEMENT	MACKIE, GEORGE A.
10846169	Not Issued	030	05/13/2004	EFFICIENT BATTERY POWERED ELECTRONIC PARKING METER	MACKAY, GEORGE
10709596	Not Issued	030	05/17/2004	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	MACK, GEORGE L.
10304193	Not Issued	161	11/26/2002	PARKING METER RESET DEVICE	MACKAY, GEORGE
10279513	Not Issued	030	10/24/2002	PAY AND DISPLAY PARKING MACHINE WITH PARKING CITATION PAYMENT	MACKAY, GEORGE
10273029	Not Issued	030	10/17/2002	USE OF CELLULAR PHONES FOR PAYMENT OF VENDING MACHINES	MACKAY, GEORGE
09971820	6764551	150	10/05/2001	PROCESS FOR REMOVING	MACK, GEORGE L.

				DOPANT IONS FROM A SUBSTRATE	
<u>09961610</u>	<u>6725754</u>	150	09/24/2001	WORKPIECE POSITIONING DEVICE	MACKENZIE, GEORGE L.
<u>09890907</u>	<u>6818163</u>	150	11/16/2001	NANOCOMPOSITE ARTICLES AND PROCESS FOR MAKING	MACKEY, GEORGE A.
<u>09713408</u>	<u>6310112</u>	150	11/15/2000	HYDROGENATED VINYL AROMATIC POLYMER FOAMS	MACKEY, GEORGE A.
<u>09662684</u>	Not Issued	164	09/15/2000	METHOD TO REDUCE POST-DEVELOPMENT DEFECTS WITHOUT SACRIFICING THROUGHPUT	MACK, GEORGE
<u>09553293</u>	<u>6293177</u>	150	04/20/2000	WORKPIECE POSITIONING DEVICE	MACKENZIE, GEORGE L.
<u>08573797</u>	Not Issued	161	12/18/1995	CONVERTIBLE FISHING LURE	MACKAROUS, GEORGE
<u>07768215</u>	<u>5297383</u>	150	10/11/1991	"TILE CLIP, APPARATUS AND INSTALLATION METHOD"	MACKAY, GEORGE R.
<u>07542875</u>	Not Issued	161	06/25/1990	PRINTED EMBOSSED FABRIC WITH INTERMEDIATE ADHESIVE LAYER	MACKAROUS, GEORGE
<u>07466900</u>	<u>5004129</u>	150	01/18/1990	SELF-VENTING CONTAINER	MACK, GEORGE F.
<u>07093360</u>	<u>4828964</u>	150	09/04/1987	POLYIMIDE FORMULATION FOR FORMING A PATTERNED FILM ON A SUBSTRATE	MACK, GEORGE L.
<u>07063265</u>	Not Issued	168	06/17/1987	POLYIMIDE FORMULATION FOR FORMING A PATTERNED FILM ON A SUBSTRATE	MACK, GEORGE L.
<u>06767347</u>	Not Issued	161	08/20/1985	POLYIMIDE FORMULATION FOR FORMING A PATTERNED FILM ON A SUBSTRATE	MACK, GEORGE L.
<u>06679858</u>	<u>4632149</u>	150	12/10/1984	ROTARY VALVE FOR INTERCONNECTING CONDUITS	MACK, GEORGE
<u>06669968</u>	<u>4585684</u>	150	11/09/1984	EMBOSSED CREST, BADGE AND THE LIKE WEARING ORNAMENT AND METHOD	MACKAROUS, GEORGE

				OF MAKING THE SAME	
<u>06534417</u>	<u>4462854</u>	150	09/21/1983	PROCESS AND APPARATUS FOR MAKING A MULTI- POCKETED ALBUM PAGE	MACKAY, GEORGE L.
<u>06162861</u>	<u>4307099</u>	150	06/25/1980	REACTION PRODUCTS OF PYRAZOLO(1,5-C) QUINAZOLINE DERIVATIVES AND PROLINE DERIVATIVES AND METHODS FOR REDUCING BLOOD PRESSURE WHILE INHIBITING ALLERGIC REACTIONS WITH THEM	MACKANESS, GEORGE B.
<u>06146205</u>	<u>4321453</u>	150	05/05/1980	ELECTRON-BEAM WELDING	MACKERTICH, GEORGE
<u>05946976</u>	<u>4192859</u>	150	09/29/1978	CONTRAST MEDIA CONTAINING LIPOSOMES AS CARRIERS	MACKANESS, GEORGE B.


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Date: 6/22/2005
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Your Search was:

Last Name = PARKS

First Name = CHRISTOPHER

Application#	Patent#	Status	Date Filed	Title	Inventor Name 45
<u>60618885</u>	Not Issued	020	10/14/2004	INTERLINE CCD FOR STILL AND VIDEO PHOTOGRAPHY WITH EXTENDED DYNAMIC RANGE	PARKS, CHRISTOPHER
<u>60605034</u>	Not Issued	020	08/27/2004	IMAGE SENSOR FOR STILL OR VIDEO PHOTOGRAPHY	PARKS, CHRISTOPHER
<u>11009567</u>	Not Issued	030	12/10/2004	IMAGE SENSOR FOR STILL OR VIDEO PHOTOGRAPHY	PARKS, CHRISTOPHER
<u>11009566</u>	Not Issued	030	12/10/2004	IMAGE SENSOR FOR STILL OR VIDEO PHOTOGRAPHY	PARKS, CHRISTOPHER
<u>10964101</u>	Not Issued	030	10/13/2004	CHARGE-COUPLED DEVICES HAVING EFFICIENT CHARGE TRANSFER RATES	PARKS, CHRISTOPHER
<u>10939140</u>	Not Issued	030	09/10/2004	IMAGE SENSOR WITH CHARGE MULTIPLICATION	PARKS, CHRISTOPHER
<u>10924061</u>	Not Issued	030	08/23/2004	METHODS TO ELIMINATE AMPLIFIER GLOWING ARTIFACT IN DIGITAL IMAGES CAPTURED BY AN IMAGE SENSOR	PARKS, CHRISTOPHER
<u>10872607</u>	Not Issued	030	06/21/2004	LIGHTSHIELD ARCHITECTURE FOR INTERLINE TRANSFER IMAGE SENSORS	PARKS, CHRISTOPHER
<u>10871288</u>	Not Issued	030	06/18/2004	IMAGE SENSOR FOR STILL OR VIDEO PHOTOGRAPHY	PARKS, CHRISTOPHER
<u>10833917</u>	Not Issued	020	04/28/2004	IMAGE SENSOR FOR STILL OR VIDEO PHOTOGRAPHY	PARKS, CHRISTOPHER
<u>10810719</u>	Not Issued	030	03/29/2004	ELECTROPLATED COPPER INTERCONNECTION STRUCTURE, PROCESS FOR MAKING AND ELECTROPLATING BATH	PARKS, CHRISTOPHER C.

<u>10810718</u>	Not Issued	030	03/29/2004	ELECTROPLATED COPPER INTERCONNECTION STRUCTURE, PROCESS FOR MAKING AND ELECTROPLATING BATH	PARKS, CHRISTOPHER C.
<u>10809073</u>	Not Issued	030	03/25/2004	EXTENDED DYNAMIC RANGE IMAGE SENSOR WITH FIXED PATTERN NOISE REDUCTION	PARKS, CHRISTOPHER
<u>10754354</u>	Not Issued	030	01/09/2004	IMAGE SENSOR WITH REDUCED P-WELL CONDUCTIVITY	PARKS, CHRISTOPHER
<u>10719568</u>	Not Issued	030	11/21/2003	LARGE PIXEL MICRO-LENS	PARKS, CHRISTOPHER
<u>10709596</u>	Not Issued	030	05/17/2004	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	PARKS, CHRISTOPHER
<u>10672419</u>	Not Issued	030	09/26/2003	MULTIPLE OUTPUT CCD FOR COLOR IMAGING	PARKS, CHRISTOPHER
<u>10460604</u>	Not Issued	030	06/12/2003	MULTIPLE READ PHOTODIODE	PARKS, CHRISTOPHER
<u>10426336</u>	<u>6797582</u>	150	04/30/2003	VERTICAL THERMAL NITRIDE MASK (ANTI- COLLAR) AND PROCESSING THEREOF	PARKS, CHRISTOPHER C.
<u>10397761</u>	<u>6890833</u>	150	03/26/2003	TRENCH ISOLATION EMPLOYING A DOPED OXIDE TRENCH FILL	PARKS, CHRISTOPHER
<u>10334178</u>	<u>6815343</u>	150	12/30/2002	GAS TREATMENT OF THIN FILM STRUCTURES WITH CATALYTIC ACTION	PARKS, CHRISTOPHER C.
<u>10263169</u>	<u>6586784</u>	150	10/02/2002	ACCUMULATION MODE CLOCKING OF A CHARGE- COUPLED DEVICE	PARKS, CHRISTOPHER
<u>10142301</u>	Not Issued	030	05/09/2002	IMAGE SENSOR HAVING IMPROVED QUANTUM EFFICIENCY	PARKS, CHRISTOPHER
<u>10116478</u>	Not Issued	041	04/04/2002	RESET DRIVER CIRCUIT DISPOSED ON THE SAME SUBSTRATE AS THE IMAGE SENSOR	PARKS, CHRISTOPHER
<u>10098859</u>	<u>6777661</u>	150	03/15/2002	INTERLINED CHARGE- COUPLED DEVICE HAVING AN EXTENDED DYNAMIC RANGE	PARKS, CHRISTOPHER

<u>10074519</u>	<u>6590238</u>	150	02/12/2002	IMAGE SENSOR HAVING A CAPACITANCE CONTROL GATE FOR IMPROVED GAIN CONTROL AND ELIMINATING UNDESIRE CAPACITANCE.	PARKS, CHRISTOPHER
<u>10050755</u>	<u>6838787</u>	150	01/16/2002	VARIABLE BANDWIDTH CORRELATED DOUBLING SAMPLING CIRCUITS FOR IMAGE SENSORS	PARKS, CHRISTOPHER
<u>10020307</u>	Not Issued	161	11/30/2001	IMAGE SENSOR CLOCK DRIVER HAVING EFFICIENT ENERGY CONSUMPTION	PARKS, CHRISTOPHER
<u>10013797</u>	Not Issued	071	12/10/2001	A 3-D MICROELECTRONIC STRUCTURE INCLUDING A VERTICAL THERMAL NITRIDE MASK	PARKS, CHRISTOPHER C.
<u>09971820</u>	<u>6764551</u>	150	10/05/2001	PROCESS FOR REMOVING DOPANT IONS FROM A SUBSTRATE	PARKS, CHRISTOPHER
<u>09684786</u>	Not Issued	163	10/10/2000	ELECTROPLATED COPPER INTERCONNECTION STRUCTURE,PROCESS FOR MAKING AND ELECTROPLATING BATH	PARKS, CHRISTOPHER C.
<u>09660105</u>	Not Issued	061	09/12/2000	METHOD FOR REDUCING DARK CURRENT	PARKS, CHRISTOPHER
<u>09604539</u>	<u>6572982</u>	150	06/27/2000	ELECTROMIGRATION-RESISTANT COPPER MICROSTRUCTURE	PARKS, CHRISTOPHER C.
<u>09595795</u>	<u>6358855</u>	150	06/16/2000	CLEAN METHOD FOR RECESSED CONDUCTIVE BARRIERS	PARKS, CHRISTOPHER C.
<u>09559880</u>	<u>6399434</u>	150	04/26/2000	DOPED STRUCTURES CONTAINING DIFFUSION BARRIERS	PARKS, CHRISTOPHER C.
<u>09078836</u>	<u>6265278</u>	150	05/14/1998	DEEP TRENCH CELL CAPACITOR WITH INVERTING COUNTER ELECTRODE	PARKS, CHRISTOPHER
<u>09061980</u>	<u>6342131</u>	150	04/17/1998	PRECISION MULTILAYER THIN FILM AND DEPOSITION METHOD THEREOF.	PARKS, CHRISTOPHER
<u>08993743</u>	<u>5998253</u>	150	12/19/1997	METHOD OF FORMING DOPANT OUTDIFFUSION CONTROL STRUCTURE	PARKS, CHRISTOPHER C.

				INCLUDING SELECTIVELY GROWN SILICON NITRIDE IN A TRENCH CAPACITOR OF A DRAM CELL	
<u>08939209</u>	Not Issued	161	09/29/1997	METHOD AND APPARATUS FOR MINIMIZING DOPANT OUTDIFFUSION IN GATE STRUCTURES	PARKS, CHRISTOPHER C.
<u>08936029</u>	<u>6057220</u>	150	09/23/1997	TITANIUM POLYCIDE STABILIZATION WITH A POROUS BARRIER	PARKS, CHRISTOPHER
<u>08688345</u>	<u>5793075</u>	150	07/30/1996	DEEP TRENCH CELL CAPACITOR WITH INVERTING COUNTER ELECTRODE	PARKS, CHRISTOPHER
<u>08613930</u>	<u>5734190</u>	150	03/11/1996	AN IMAGER HAVING A PLURALITY OF CYLINDRICAL LENSES	PARKS, CHRISTOPHER
<u>08613306</u>	<u>5711890</u>	150	03/11/1996	METHOD FOR FORMING CYLINDRICAL LENS ARRAYS FOR SOLID STATE IMAGER	PARKS, CHRISTOPHER
<u>08606674</u>	<u>6072603</u>	150	02/26/1996	MULTIPLE OUTPUT CCD IMAGE BLOCK BALANCING	PARKS, CHRISTOPHER

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